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CHANGES IN CONCEPTS DURING AN INTRODUCTORY COURSE IN EDUCATION.

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A STUDY WAS CONDUCTED TO LEARN MORE ABOUT THE GENERAL CONCEPTUAL FRAME OF REFERENCE OF THE COLLEGE STUDENT WHO INTENDS TO GO INTO TEACHING, AND PARTICULARLY ABOUT HIS PERCEPTION OF EDUCATIONAL CONCEPTS. THE EXPERIMENTAL GROUP CONSISTED OF 245 STUDENTS ENROLLED IN AN INTRODUCTORY COURSE IN EDUCATION. THE CONTROL GROUP CONSISTED OF 68 STUDENT VOLUNTEERS IN INTRODUCTORY COURSES IN SPEECH AND ENGLISH. A SEMANTIC DIFFERENTIAL WAS DEVISED AND ADMINISTERED TO BOTH GROUPS AT THE BEGINNING AND END OF A QUARTER. THE SEMANTIC DIFFERENTIAL CONSISTED OF BIPOLAR ADJECTIVES FOR DESCRIBING EACH OF 20 CONCEPTS. WEIGHTINGS ATTACHED TO THE VARIOUS ADJECTIVES DETERMINED THE MEANING OF THE CONCEPT TO THE INDIVIDUAL. FACTORAL ANALYSIS IDENTIFIED 3 FACTORS FOR 8 HUMAN CONCEPTS AND 4 FACTORS FOR 12 ABSTRACT CONCEPTS. TWELVE CONCLUSIONS AND IMPLICATIONS RANGED FROM ESTABLISHMENT OF THE SEMANTIC DIFFERENTIAL AS A USEFUL AND RELIABLE TOOL TO DEMONSTRATION THAT BEGINNING STUDENTS IN EDUCATION IDENTIFY CLOSELY WITH THE TEACHING PROFESSION, AS NOTED BY THE SIMILARITY IN MEANING OF THE WORD "MYSELF" AND THE WORD "TEACHER." (JM)

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Cooperative Research Project Number 2619

Dale L. Bolton

University of Washington

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Seattle, Washington

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PREFACE

This study was initiated because of my concern for the attitudes that beginning students have toward the study of teaching and the setting within which teaching occurs. As I began searching for ways to describe and define the attitudes of beginning students in education, I became much more sensitive to the relationship between my own students' attitudes and their receptivity to learning. After studying Osgood's Measurement of Meaning and the subsequent research generated by the concept of semantic space, I generalized this sensitivity to the relations between language, thought, and behavior. Concurrent with these concerns were some doubts regarding whether the initial course in education was doing much to modify the conceptual framework of teachers-to-be. After much discussion with interested colleagues, I decided to develop a semantic differential for measuring the meaning of a group of concepts closely associated with education and to conduct a quasi-experiment to determine whether changes in meaning occurred.

As work on the study developed, several people contributed ideas and suggestions, and many people expressed interest. Joan Lockhard was helpful in the early planning stages; Dale Mattson, Tom Langen, and Clifford Lunneborg assisted at several stages of the statistical analysis; Lester Cummins and Neil Farler performed many tasks as research assistants; Robert Kintner and Stuart McAlpine did the programming and data processing; several members of the Speech and English Departments assisted in recruiting control subjects; and Sharon Verharen, Pam McAlpine, and Bea Langford did the major part of the secretarial work connected with the project. The work of these people, the assistance of the Numerical Analysis Laboratory, and the funds received from the Graduate Research Fund of the University of Washington are appreciated.

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CHAPTER I

INTRODUCTION TO THE PROBLEM

The Problem

Whether an individual learns specific information during his undergraduate education that will be helpful to him as a teacher is determined to a certain degree by his general conceptual frame of reference. His self-concept and how he perceives various aspects of society affect the amount of inquiry he is willing to make into other meanings, procedures, and beliefs. Because of the relationship between the meanings of concepts held by an individual and the effect that these meanings have on his perception of messages received and on future learnings, there is a need to know more about the college student's conceptual frame of reference in relation to teaching, teachers, and self. With this need in mind, a study was designed for the following purposes:

1. To determine similarities and differences in the meanings of various concepts, all directly related to education, held by persons taking an introductory course in education.

2. To determine whether the meanings of these concepts changed during the course.

3. To determine whether various sub-groups within the total group had different semantic structural frameworks.

The accomplishment of these purposes required an instrument sensitive enough to differentiate among the various concepts and to measure any change in meaning over a period of time. Therefore, the study included the development of a generalized measuring instrument for determining the meaning of a particular class of concepts, all dealing with or related to people and/or education (viz., pupils, parents, teachers, society, administrators, human beings, education instructors, myself, teaching, learning, philosophical beliefs, classroom observations, ethics, education courses, class decisions, and psychology).

The definition of meaning used in this report was developed by Osgood and his associates (Osgood, Suci, and Tannenbaum, 1957). A group of bipolar adjectives was used for describing a concept, and the weightings that a student attached to the various adjectives determined the meaning of the concept to him. Factor analytic methods were used to simplify the reactions to the instrument, resulting in fewer dimensions of a semantic space. Osgood named the instrument a semantic differential, and his use of the instrument indicates that it may be used for differentiating among concepts and for measuring change in meaning. This is accomplished by locating the position of concepts in a semantic space.

The semantic space under consideration is assumed to be Euclidian and forms an expression of the conceptual structure of individuals or of groups.

The semantic space is multi-dimensional, the number of dimensions being determined by the number of factors that identify a meaning. If a group of concepts are within the same semantic space, i.e., having the same sets of mutually orthogonal axes, their location within this space allows a comparison of the concepts.

Once the concepts are located within the semantic space, the following generalized distance formula may be used for determining the relation between them:

$$D_{il} = \sqrt{\sum_{j=1}^{k} d_{il}^{2}}$$

This formula expresses the relationship between concept i and concept l by taking into account the profile covariation and the discrepancies between the means of the profiles of the concepts on the various factors that determine the meaning of the concepts. D_{il} is the linear distance between the points in the semantic space representing concepts i and l and d_{il} is the algebraic difference between the coordinates of i and l on the same dimension or factor, j.

An instrument developed for differentiating among concepts and for measuring changes in meaning might, of course, be utilized for prediction purposes (and consequently selection purposes), for determination of emphasis within a curriculum in order to modify particular conceptions, and for determination of the effectiveness of the curriculum in modifying these conceptual frameworks. Although these more general uses may be made of the instrument, the central concern of this study was to determine whether changes of meaning occurred in order to determine the effectiveness of the organization of the course.

The selection of the 20 concepts was made on the basis of: (a) their relevance to the social foundations content of the introductory course, and (b) their relevance to key people involved in the education process. A conscious attempt was made to include concepts about which students might have negative attitudes or which might change in meaning as a result of information the students received.

The information provided by this study is distinctive in the following ways: (a) It provides a measure of changes in meaning (one dimension of which is attitude) during a period of instruction rather than during therapy or following a single communication. The procedures developed are useful for determining effectiveness of various procedures for bringing about changes in these concepts. The nature of the information is significantly different from that obtained from more traditional tests and is related to both the cognitive and the affective domains. (b) It provides a foundation for work that will relate behavioral change to semantic change. Some of the criticisms of attitude studies center in the view that attitudes fail to predict overt behavior. It is hoped that differential behaviors may be better predicted as a result of knowledge regarding all dimensions of meaning rather than one, and this study provides some foundational work for such investigation. (c) It provides information regarding the meaning of a specific class of concepts that have peculiar meaning to the field of professional education. This information should assist professors to relate student meanings of concepts to their own meanings of the concepts and should promote adaptations that will facilitate communication. (d) It provides objective information regarding the degree of identification the students have with the profession. This information can be noted by comparing meanings for the concepts of pupils, teacher, and myself.

Objectives

Changes of Meaning

In order to determine whether the meanings of the various concepts changed during the course, the following null hypothesis was established for testing:

> Hypothesis 1. For beginning students in education, there is no significant change in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential during a one-quarter course in education.

A beginning student in education was considered to be any student enrolled in the course "Principles of Education." This course is the first one required of all students seeking certification through the University of Washington for service in the State of Washington and serves as a prerequisite to other courses in the certification and degree patterns. A factor score was the mean of the scales included in the factor as determined by the factor analysis procedure described in Chapter II, page 14.

Similarities and Differences

In order to determine similarities and differences in the meaning of the various concepts, the following hypotheses were established for testing:

> Hypothesis 2. At the beginning of a one-quarter course in education, students perceive no significant difference in the distance between each pair of the 20 concepts in the semantic space as measured by a semantic differential.

> Hypothesis 3. At the end of a one-quarter course in education, students perceive no significant difference in the distance between each pair of 20 concepts in the semantic space as measured by a semantic differential.

> Hypothesis 4. Beginning students perceive no significant difference in the distance between a given concept, when measured at the beginning of a course in education, and any of 19 other educational concepts, when measured at the end of the course, in the semantic space as measured by a semantic differential.

The semantic space under consideration was multi-dimensional, the number of dimensions being determined by the number of factors that identified a meaning of a concept. Within this space, distance was measured by a generalized distance formula. (See p. 2)

Subgroups

In general university classes are composed of individuals who have selected the course because of some need. That is, they have not been assigned according to any specific variable other than a need for the course. For this reason, a class is seldom homogeneous with respect to any other given variable. Therefore, the possibility exists for regrouping the class in order to provide for more homogeneity with respect to a particular variable. If the regrouping also provides more homogeneity of conceptual framework (that is, if greater differences exist between the new subgroups than within them), instruction might be facilitated. The variables of age, sex, aspiration, and prior courses were utilized for determining subgroups and the following hypotheses were established for testing:

Hypothesis 5A. At the beginning of a one-quarter course in education, there is no significant difference among various age groups, (viz., less than 26, 26-35, greater than 35) in the factor scores that determine meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5B. At the beginning of a one-quarter course in education, there is no significant difference between males and females in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5C. At the beginning of a one-quarter course in education, there is no significant difference between those who have definitely decided to become teachers and those who have not made this decision, in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5D. At the beginning of a one-quarter course in education, there is no significant difference among those who have had varying backgrounds in the social sciences, (viz., less than 13 quarter credits. 13-24 credits, 25-36 credits, greater than 36 credits) in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Related Research

Stimulation of Osgood

In devising the semantic differential C. E. Osgood and his associates (1957) contributed much to improving the measurement of meaning. Their book summarized several years' work with the instrument and definitively answered questions regarding relationships of meaning to learning theory; operational definitions of attitude (the evaluative dimension of meaning) and meaning; the validity, reliability, objectivity, sensitivity, and comparability of the instrument; assumptions regarding the distance (D) measure; and applications of the instrument to various research problems. Criteria were given for selection of concepts and selection of scales for measuring the meaning of concepts.

Osgood, et al., pointed out that attitude studies had been criticized in the past because they had not been able to predict overt behavior; but in using the semantic differential, attitude is only one of the dimensions of meaning and consequently provides only part of the information needed to predict behavior. For example: "One subject rated THE NEGRO as unfavorable, strong, and active; another subject rated THE NEGRO as equally unfavorable, but also as weak and passive." (pp. 198-9) In spite of this assertion that multi-dimensions of meaning should yield a better prediction of behavior, the authors indicated the need for additional evidence to "show that differential behaviors, voting and otherwise, can be better predicted knowing the characteristic attributes of a subject's reference frame than without this information." (Osgood, et al., p. 124.)

When discussing the potential of the instrument, Osgood, et al., raised the question: "When the characteristic attributes for two groups judging the same concepts can be shown to differ, . . . , do the members of these groups have difficulty communicating with one another?" If this hypothesis is true, it poses the need for teachers to know the meanings that students attach to concepts relevant to the behavioral changes sought.

The 1957 book was essentially a progress report and indicated much work that needs to be done in the construction of generalized semantic measuring instruments that can be used for all classes of words. The authors stated, "In the last analysis it may be necessary to construct separate measuring instruments for each class of concepts being judged, but for both theoretical and practical reasons we hope this will not be the case." This study departed from the work of Osgood in that it constructed a separate instrument (although many of the scales reported by Osgood were used) for the particular class of concepts being judged and in that the application was different from any of the personality or communication research reported.

Winter (1961) investigated the evaluative dimension of professors and students and related the scores on a semantic differential to final grades of the students. The relationship indicated that if students were able to predict the values held by the professor, their grades were higher; if student values were similar to those of the professor, their grades were likewise higher. Winter's study is related to the hypothesis stated in Howard's (1963) conceptual scheme for teacher training which indicates that there should be a positive relationship between the definition of good teaching exemplified by instructors' and students' conceptions at the end of a given program. Howard introduced a model for teacher education by indicating a need for empirical verification of changes that occur in teachers-to-be during their education. Recognition was given to the assumption that students come into the program with certain characteristics; one of the major characteristics considered for change in the model is the student's conception of teaching. Likewise, examples were cited regard-the inconsistency of students' perceptions of teaching, and a plea was made for empirical evidence of the relationship between students' and professors' conceptions of teaching.

Behavior and Meaning

A recurring problem reported by these studies (Osgood, 1957; Howard, 1963; Winter, 1961) was the relationship between behavioral changes and semantic changes. Kerlinger (1963) discussed a directive-state theory which indicates that there is a central directive state that is formed out of the values, attitudes, emotions, and motives of the individual. Kerlinger proposed that the central directive state in teacher-effectiveness is attitude and that the attitude of a teacher is a readiness or predisposition to act in a certain way toward things in the environment. (This definition differed from Osgood's operational definition of attitude, in that Osgood defined attitude as being the evaluative dimension of meaning.) Attitudes give psychological continuity to the individual's life and allow him to respond to complex stimuli by providing him with a prejudgment of his surroundings. The attitudes of a teacher affect his perception, in that there "must be some substantial congruence between values and attitudes, on the one hand, and images and perceptions, on the other hand" (Kerlinger, 1963, p. 8). Osgood and Tannenbaum's principle of congruity supports this relation between attitude and perception: "changes in evaluation (i.e., attitude) are always in the direction of increased congruity with the existing frame of reference" (1955, p. 43). Likewise, Boulding (1961) asserted that the values of an individual are probably the most important element for determining how the messages he receives affect his images of the world.

Osgood and his associates contributed to the understanding of the relation between semantic changes and behavioral changes in that they gave precision to statements by operationally defining meaning. They then asserted that meaning is one of the most important determinants of human behavior (Osgood, et al., 1957, p. 10). Within Osgood's conceptual structure of meaning, Fishbein and Raven (1962) defined the probability of meaning as "belief." The results of their study indicated that "change in attitude toward a given concept can result from a change in belief about that concept." When this is true and when there is a relation between meaning and behavior, the semantic differential becomes a powerful tool in prediction of behavior.

Hyman (1964, p. 7) explicated the relation between a person's conceptual system and his cognitive processes. He indicated that the conceptual system assists in attaching significance to new facts and in determining the relevance of issues. The process of inquiry is based on the unity and coherence of the conceptual framework. This rationale indicates that meaning of concepts is directly related to thought processes as well as overt behavior.

If a person's conceptual structure is related to behavior, then it would follow that changes in conceptual structure would bring about changes in behavior. Therefore, work has been done to bring about changes in conceptual structures. Endler (1961) found that changes in meaning occurred during psychological treatment and that meaning as measured by the semantic differential can serve as an index of adjustment and therapeutic improvement. Likewise, Luria (1959) concluded that a therapy group showed a significant improvement in its judgment for the self concept after therapy (as measured by the semantic differential) and indicated that "Therapy may well prove to be a process of reinforcement for semantic agreement by the client with the therapist's meaning system. . ."

There is a relation between the tasks of the therapist and the teacher, and Kerlinger asserted that ". . . one of the prime jobs of the teacher is to bring about greater perceptual congruence between herself and the pupil" Kerlinger (1963). At the same time, this job of bringing about perceptual congruence is itself facilitated by the cognitive similarity of the teacher and pupil. Triandis (1960) found that "The more similar the semantic profiles of a given concept, as judged by two people, the more likely it is that they will be able to communicate effectively about that concept." Abelson (1964) applied similar thinking to small groups. He concluded that compact groups tended toward homogeneity of attitude positions where they were engaged in mutual dyadic interactions that tended to cause each pair of individuals to adopt similar attitudes. All three of these studies suggest the need for instructors to know the meanings that students attach to concepts if they are to communicate with students and thereby promote change in the direction of perceptual congruence. Abelson's study further suggested the need to know whether a group engaged in common activities, but not dyadic interaction, changes in the direction of homogeneity of attitude positions.

Meaning and Identification

University students who intend to become teachers may identify with other persons or groups more than they do with teachers; they may perceive themselves and their needs as much different from teachers'. Howard (1963) indicated that teacher preparation programs should be designed to modify both the students' personal needs and their perceptions of teaching and teachers. If such changes occur in students, presumably they will identify more closely with teachers than they did prior to their preparation for teaching.

Husek and Wittrock (1962) utilized 117 scales on a semantic differential investigating the meaning of one concept, school teachers, with 259 college students. The major dimension found was the evaluative factor. The authors made a plea for research to consider the nature of the factor structure peculiar to the domain under study when investigating attitudes toward teaching and the teaching profession, but they limited the number of concepts studied to one. This study differed from the Husek and Wittrock study in that it considered a class of concepts in determining the factor structures that give a motivational and directive state to individuals going into teaching.

Crites (1962) administered a semantic differential to measure identification with parents and the Strong Vocational Interest Blank to obtain an interest profile. He concluded that a son's identification with both of his parents significantly affects the patterning of his interests but that his identification with the father is more important.

Jackson and Moscovici (1963) indicated that our understanding of the teacher's personality is severely limited and reported a study of teachers-to-be that should add to our understanding of this area. The study used the Draw-a-Teacher Test, the Word Association Test, and the Word Completion Form to determine that students preparing to teach are already beginning to identify with the professional role of the teacher. All of the instruments used--drawings and free association tests--lack much in the criterion of objectivity. This study provided information regarding identification with the profession (especially with the relationship of myself to teacher) but with an instrument that was much more objective than the ones used by Jackson and Moscovici.

Willower (1962) interviewed 60 undergraduate students for the purpose of determining their perceptions of school administrators. He used an open-ended structured questionnaire that gave some indication of dimensions which might be explored in this area (e.g., relation to authority, conservative-liberal, friendliness, intelligence, educated), and made an appeal for the profession to create a clearer image of the position of administration. It may be that the procedure itself did not allow a precise measure of meaning of the school administrator to the undergraduate student. This study should not only allow more precision in the measurement of such meaning, but also it should determine if this meaning changes with additional information.

Triandis (1959, 1960a, 1960b) reported three interesting studies related to the differences in perceptions of workers and managers and the communication between these two groups. He indicated that the semantic differential is capable of differentiating between the meanings of certain attributes of different jobs and that managers make finer distinctions between jobs than the workers do. The level of the job is the most significent variable in the perception of jobs. Triandis concluded that management ought to consider the perceptions of workers regarding their jobs when communicating with the workers.

Osgood, Ware, and Morris (1961) utilized the semantic differential to measure college students' identification with various ways of living or of the "good life." They found the semantic differential capable of differentiating among thirteen "ways to live." The student preferences proved "to be very stable in the cultural sense."

Summary

In order to learn more about the general conceptual frame of reference of the college student who intends to go into teaching, and more particularly about his perception of educational concepts, a study was conducted for accomplishing the following purposes:

1. To determine similarities and differences in the meaning of various concepts--all directly related to education--held by persons taking an introductory course in education.

2. To determine whether the meanings of these concepts changed during the course.

3. To determine whether various sub-groups within the total group had different semantic structural frameworks.

The definition of meaning used was developed by Osgood and his associates, who employed a semantic differential consisting of bipolar adjectives for describing a concept; the weightings attached to the various adjectives determine the meaning of the concept to the individual. A semantic differential was devised for measuring the following concepts: pupils, parents, teachers, society, administrators, human beings, education instructors, myself, teaching, American public schools, cadet teaching, education, historical information, learning, philosophical beliefs, classroom observations, ethics, education courses, class decisions, and psychology. The concepts were selected on the basis of their relevance to the social foundations content of the introductory course in education and their relevance to key people involved in the education process.

The information provided by this study is distinctive in that it furnishes: (a) a measure of changes in meaning during a period of instruction rather than during therapy or following a single communication, (b) a foundation for work that will relate behavioral change to semantic change, (c) information regarding the meaning of a specific class of concepts that have peculiar meaning to the field of professional education, and (d) objective information regarding the degree of identification students have with the profession.

The research related to this study was stimulated by the work of C. E. Osgood and his associates in the development of the semantic differential for the measurement of meaning. The theory of a multi-dimensional semantic space has been well accepted by research personnel, as evidenced by the number of studies using the instrument since Osgood's report was made in 1957. Although Osgood's work was done in search of a generalized instrument for measuring the meaning of all concepts, he pointed out that it may be necessary to construct separate measuring instruments for each class of concepts. This study is concerned with a particular class of concepts rather than with all classes of concepts.

A recurring problem of concern to several studies reported in this chapter is the relationship between an individual's semantic structure and his behavior. When attitudes, beliefs, values, and motives change, does behavior change? The studies reviewed indicate that there is merit in the view that an individual's conceptual frame of reference contains more than one dimension, that these dimensions have an interrelationship (i.e., changes in one dimension can cause changes in another), and that there is a relationship between the conceptual frame of reference and behavior (i.e., changes in concepts can cause changes in behavior). This study did not attempt to verify these views but had as one of its purposes a determination of whether a given treatment produced changes in semantic structure. Such information would form the basis for determining whether these changes would be related to behavioral changes.

Perhaps one of the most important aspects of an individual's views of the world is his perception of other people and his identification with them. Several studies have been conducted to determine students' perceptions of teachers and the teaching profession, of parents, and of administrators. Relationships have been noted between identification with parents and student interests, indicating that identification with parents strongly affects interests. This study was designed to compare a person's self-concept with several other key figures in his life as a student and future teacher.

Chapter II describes the procedures used in the study and Chapter III reports the results of a procedural problem encountered while determining the factors that were common to the various concepts on the two occasions the instrument was administered. Chapter IV analyzes the similarities in meaning of the various concepts studied; Chapter V analyzes the changes in meaning that occurred as a result of the treatment administered; Chapter VI analyzes the differences in the semantic structure of the various sub-groups; and Chapter VII presents a summary of the study and the conclusions. The appendix includes an analysis of the reliability of the instrument used.

CHAPTER II

PROCEDURES

The purpose of this chapter is to outline the procedures followed in the study. Information will be provided on the experimental design used, including the method of selection of the experimental and control subjects, the design and administration of the instrument, the nature of the treatment of the subjects, and the analysis of the data.

Experimental Design

A before-after, one-control design followed what Campbell and Stanley (1963) describe as a quasi-experiment, in that the control and experimental subjects were nonequivalent in the sense of having been randomly assigned to their groups. The semantic differential was administered to both groups at the beginning and end of a quarter.

The experimental group consisted of 345 students in all sections of an introductory course in education at the University of Washington during the winter quarter, 1964. The course was required of students in the College of Education and any other students who desired to be certificated for teaching in the State of Washington. Sections of the course usually include mainly sophomores and juniors, although some seniors and students with bachelor degrees are normally enrolled in the course. Of the 345 students who were enrolled in the course, 245 students properly completed the test with usable information both times.

The control group consisted of 69 volunteer students in introductory courses in speech and English. Control subjects were paid a nominal amount on completion of both tests in order to encourage faithful completion of the tests. Of the 69 subjects who completed both tests, one was eliminated because of omission of parts of the tests. There was no attempt to match the control group with the experimental group although their scores at the beginning of the experiment were compared in order to determine the similarities of the two groups.

The primary purpose for using the control group was to ensure that the results obtained were not attributable to contemporaneous events (C)--both internal, i.e., maturational effects, and external, i.e., historical effects, to test effects (T), or to test by contemporaneous events interaction effects (T x C). That is, it was desirable to attribute any changes noted in the meanings of the concepts studied to the treatment obtained in the course in education. If no control group had been used, it would have been necessary to assume no C, T, or T x C effects. Because of the existing institutional conditions, it was impossible to randomly assign subjects to the control and experimental groups; consequently, the alternative plan of selecting subjects from courses similar to those that education students would normally take in their general education background was chosen. This procedure is weak in comparison with random assignment, but the nonequivalent control group was considered to be the most adequate check that could be provided of the assumptions that would need to be made if no control group were used.

The utilization of a single control in a before-after experiment assumes no test by treatment (T x Tr) or treatment by contemporaneous events (Tr x C) interaction effects on the final test results; the same assumptions were made for this study. Both of these assumptions appeared to be reasonable considering the general nonreactive nature of the test and the treatment and the plausibility that, in cases of ignorance, main effects are more likely than interactions (Campbell and Stanley, 1963). No spectacular campus or current events were observed during the quarter that might have influenced the results.

Design and Administration of Instrument

Eight of the concepts studied dealt with human variables: pupils, parents, teacher, society, administrators, human beings, education instructors, and myself. These concepts were measured by 26 scales consisting of bipolar adjectives with seven points separating the adjectives. Twelve of the concepts were abstractions: teaching, American public schools, cadet teaching, education, historical information, learning, philosophical beliefs, classroom observations, ethics, education courses, class decisions, and psychology. These abstract concepts were measured by 30 bipolar scales. (See Appendix A for a copy of two pages of the instrument used. One page illustrates the scales used for the human variables and the other illustrates the scales used for the abstract concepts.) Students were asked to indicate their perception of the meaning of the concepts by checking a point on the descriptive scales.

One page was used for each concept and all of the scales for that concept were on the page. The following is an example of the format used:

TEACHERS

valuable ____:____:____|____|____:____:____ worthless

unpleasant ____:____:____|____|____:____:____ pleasant

passive ____:____:____|____|____:____:____ active

The scales were selected in the following manner: lists of bipolar adjectives were selected from Osgood's (1957) listings in the major dimensions identified as evaluative, potency, and activity. Additional adjectives were selected from dimensions that were not as clear-cut as the major dimensions identified by Osgood but which seemed to the investigator and to graduate assistants to have some relevance to the connotative meaning of the concepts. From the total listings, scales were selected that seemed to have particular relevance to each of the concepts chosen. A comparison was then made of the adjectives chosen for the concepts relating to human variables, and adjectives common to the total grouping were selected for final use. Care was taken to include at least three scales in each of the major dimensions, i.e., evaluative, potency, and activity. A similar comparison was made in order to select common adjectives for the abstract concepts. When the final form was devised, the scales representing what was assumed to be the same factor were alternated in polarity direction to prevent the formation of position preference, and the order of the factors represented was rotated.

Concepts were selected in the following manner: the investigator and graduate assistants identified a group of concepts that had a relevance to the social foundations content of the introductory course in education and which would help to identify the students' conceptual frame of reference in relation to teaching, teachers, and self. There was a conscious attempt to include concepts about which students had negative attitudes, or whose meaning in the evaluative dimension might change as a result of information received by students. Once the total list had been devised, similar concepts were eliminated along with concepts that were considered to be less relevant to the class of concepts with the properties identified above.

Written instructions (see Appendix) following a format suggested by Osgood (1957) were presented to the students during a regularly scheduled period of the first and last week of the quarter. They were given two minutes to read the single page of instructions and then were asked if they had any questions. When all questions were answered, they were orally cautioned: (a) to make certain that they marked in the spaces on the scales, (b) to complete all of the pages, and (c) to use the center space on the scale if both end points were equally attractive or if the scale seemed irrelevant to the concept being judged. They were then allowed to complete the task; few students took more than 50 minutes to complete it.

Each booklet was identified with a number, and the student kept a card with the same number for identification at the second administration. The second administration followed the same instructional procedure as the first.

Treatment of the Subjects

The course "Principles of Education" consisted of a general orientation session, 19 lecture sessions, six visits to public schools, and a two-hour final examination period. A common text was used for all sections (Hillway, 1961). Although a common examination was not used, test items were shared by the five instructors teaching the course. A common description of the nature of the reports to be written describing the weekly visits. Although all instructors had complete freedom regarding the content and sequence of their lecture periods, there was general agreement that the content would be an elaboration of the introductory material in the text. There was no attempt by the experimenter to structure the presentations of the various instructors.

The six school visits consisted of three visits to elementary schools, two visits to junior high schools, and one visit to a high school. Each visit was for one hour. The written reports emphasized the description and analysis of the situation observed.

Analysis of Data

Analysis of the data included the use of IBM data processing equipment. The initial data were punched on IBM cards, using one card per concept. The cards were sorted according to identification information on each card, and a listing of the cards allowed the elimination of subjects that had not completed all information for the two administrations of the task.

Since there were 26 scales involved in the measurement of meaning of the eight human variables and 30 scales used for measurement of meaning of the 12 abstract concepts, it was necessary to determine whether some of these scales actually were measuring the same factor or dimension of the concept.

Library programs available at the University of Washington Numerical Analysis Laboratory were utilized to compute the 26 x 26 correlation matrices for each of the eight human variables and the 30 x 30 matrices for each of the 12 abstract variables. These matrices were used as input for computing principal axis factor analyses, and these were then rotated to simple structure via Kaiser's varimax.

In order to compare all of the abstract concepts, it was necessary to find factors that were common to all 12 of these concepts. A procedure was developed to identify for each factor the scales that loaded high across all concepts in the abstract category; these scales were identified as the ones that determined a factor which was common to all 12 concepts. The same procedure was followed for identifying the scales that determined the factors for the eight human variables.

A program was then written for computing factor scores of the various concepts at the beginning and end of the experiment. Likewise, a program was written for the computation of gain or difference factor scores.

Since the distribution of the distance scores, D_{il}, was unknown and probably not normal (Osgood, 1957, p. 101) it was necessary to utilize non-parametric tests of significance to determine differences in meaning of the various concepts and changes that occurred during the experiment. Programs were written for the Kruskal-Wallis, the Wilcoxon matched-pair signed ranks, and the Mann Whitney U tests and a library program for Chi Square was used.

An estimate of the reliability of the factor scores was obtained in the following manner: the total group (experimental plus control) was randomly divided into groups of 24. It was assumed that the true factor scores were the mean factor scores of the total group. For each factor, a distribution of the deviations of the group mean scores from the "true" scores was computed (Osgood, 1957, P. 139). Since groups were assumed to be equal, these distributions were a measure of the extent to which factor scores varied by chance.

A second estimate of reliability was obtained by using a formula suggested by Horst (1949):

$$r = 1 - \frac{\dfrac{\dfrac{\sigma^2}{n_i - 1}}{N}}{\sigma_M^2}$$

where N = number of concepts = 8
n_i= measures of ith concept
σ^2= variance of factor scores for the ith concept
M_i= mean factor score for the ith concept
$\sigma_M{}^2$= variance of the means for the concepts being measured

A reliability coefficient was computed for each factor for both the abstract and the human concepts.

Summary

The design of the study was a before-after, one-control quasi-experiment in which the control and experimental subjects were nonequivalent in the sense of having been randomly assigned to their groups. The experimental group consisted of 245 students enrolled in an introductory course in education at the University of Washington. The control subjects consisted of 68 volunteer students in introductory courses in speech and English. A semantic differential was administered to both groups at the beginning and end of a quarter.

The concepts utilized in the study were selected by the investigator and graduate students. Relevance to the social foundations content of the course, to the undergraduate student's conceptual frame of reference in relation to teaching, and to common negative attitudes that might be changed as a result of information were used as criteria for selection. The scales used in the study were selected in terms of their relevance to the particular class of concepts being judged and to the major dimensions found in prior studies.

The introductory course in education was the treatment in the experiment. It consisted of lecture periods, visits to public schools, and independent reading of common materials.

Analysis of the data included principal axis factor analyses (with rotation to simple structure via Kaiser's varimax), the development of a procedure for determining common factors, the computation of factor scores and difference scores, and the utilization of the following nonparametric tests of significance: Kruskal-Wallis, Wilcoxon matched-pair signed ranks, Mann Whitney U, and Chi Square. A procedure suggested by Osgood (1957) and a formula suggested by Horst (1949) were used for checking the reliability of the instrument.

CHAPTER III

A METHODOLOGICAL PROBLEM: DETERMINATION OF FACTOR SCORES

A problem encountered in this study was that of determining whether the concepts being studied had common factors or dimensions. If the concepts did not have common dimensions, they could not be compared. Since the measurement of the abstract concepts used 30 scales that were different from the 26 scales used to measure the human variables, the problem of determining common factors actually consisted of two separate problems. That is, it was necessary to determine the factors common to the abstract concepts separately from a determination of the factors common to the human variables. Because of the nature of the data collected, these problems generalized to the problem of analyzing data that was classified in four ways. This chapter explains the analysis procedure used and presents the results as they apply to the abstract and human variables.

Procedure for the Abstract Concepts

Several authors have been concerned recently (Osgood, _et al_., 1957; Campbell and Fiske, 1959; Horst, 1963, 1964; Tucker, 1963, 1964) with the problems centering in the analysis of data which may be classified in more than two ways. The traditional analysis has been made on attributes (or characteristics) and entities (or people). Factor analytical and related methods have been quite useful in determining simple structures for expressing the meanings of these two-dimensional matrices. Work is being done to extend this approach to three or more dimensions. Until these procedures are fully developed, however, less elegant approaches may be useful in the analysis of such data.

The use of data collected on the abstract concepts will be presented first as an illustration of a procedure for the analysis. The semantic differential for the abstract concepts consisted of 30 scales of bipolar adjectives separated by seven points. The scales were administered to 313 students in college courses at the beginning and at the end of a quarter at the University of Washington. Therefore, a system utilizing four classifications represents the data. In keeping with previous work in this area (Horst, 1964), the students may be considered as _entities_, the scales as _attributes_, the times when the tests were administered as _occasions_, and the concepts as _conditions_. A fifth classification is possible where more than one "evaluator" is used, but this was not involved in this project.

The problem, then, was to develop a set of scales that would be useful in the comparing of concepts from one time to another. If it had been necessary to consider only one concept, it would have been relatively straightforward to do a factor analysis of the 30 scales for the total number of students and determine whether the factor scores changed from one time to another. The factor scores could have been computed by using the loadings of the scales in the factor and there would have been no serious or unmanageable problems in the procedure. However, when the different concepts (conditions) had to be considered, the procedure was not nearly so straightforward. This analysis provides information regarding how scales that loaded high on the same factor over a set of concepts, and which were independent of each other, were determined.

First, an assumption was made regarding the stability of the scales from time 1 to time 2. If the scales had not been stable, i.e., if students had interpreted the scales differently at different times, then the change that occurred in the meaning of concepts could not have been measured via this procedure. However, work by Messick (1956, 1957), Norman (1959), and Kelly and Levy (1961), indicates that the semantic differential has considerable discriminability and reliability. Therefore, the assumption that the meaning of the scales would remain constant over the period of the experiment allowed the combining of the data collected at time 1 with the data collected at time 2. This reduced the classifications under consideration to three, viz., students at time 1 and time 2 (entities), scales (attributes), and concepts (conditions). A six-factor, five-factor, four-factor, three-factor, and two-factor analysis was completed (and rotated to simple structure via Kaiser's varimax) for each concept. The eigenvalue of the sixth factor for each concept was very close to one, and the per cent of variance removed by the sixth factor approached 3 1/3% (1/30 of 100% = 3 1/3%), indicating that virtually all of the real factors had been removed. Scales that identified factors were determined by noting the high loadings in the rows of the rotated factor loading matrix for each of the six-factor analyses. The six-factor analysis was examined first for each of the concepts.

Table 3.1 shows the six-factor analysis for the 12 abstract concepts. The column on the left lists the scales that loaded on the factors, while the numbered columns indicate the concepts used. The cells in the table note the factor on which the scale loaded for the particular concept. Where the cell is empty, the loading was clearly on another factor for the concept being considered. Where the loading was "mixed," the two loadings are given following the factors on which they loaded. For example, on concept 11, valuable--worthless loaded .52 on Factor III and .28 on Factor I; on concept 1, the loading for meaningful--meaningless was clearly on another factor.

It will be noted that the first factor, named an EVALUATIVE factor, had no scale which consistently loaded high on it across all concepts. On the other hand, meaningful loaded on 11 concepts, valuable on 11, vigorous on 10, and interesting on 11, with two of these last three scales having mixed loadings on other concepts. The remainder of the scales listed with Factor I were much less consistent in their loadings across all 12 concepts, indicating that the structure of the meaning of the concepts being considered was not so "simple" when all of the concepts were compared. It also suggests the possibility of looking at the five-factor analysis to determine whether the structure there clarifies the relationship among the variables being considered.

In Table 3.1, it may be noted that the first five scales in Factor II, named a "systematic" POTENCY factor, had two scales consistent across all 12 concepts, one with high loadings on 11 concepts, and two with high loadings

Table 3.1

A Six-factor Analysis of 12 Abstract Concepts with 30 Scales

	Concept *											
Scale	1	2	3	4	5	6	7	8	9	10	11	12
Valuable-worthless	1	1	1	1	1	1	1	1	1	1	1:28 3:52	1
Vigorous-feeble	1	1	1	1	1	3:40 1:36	1	1	1	1	1	3:46 1:43
Interesting-boring	1	1	1	1	1	1	3:52 1:49	1	1	1	1	1
Meaningful-meaningless		1	1	1	1	1	1	1	1	1	1	1
Complex-simple	1	1	1	1		1	1	6:53 1:50		1	3:52 1:49	1
Motivated-aimless	1	3:54 1:41	1	6:51 1:45	4:55 1:51	2:34 1:34	1	1	4:54 1:43		3:63 1:27	
Active-passive		1	1	1		1			1		3:64 1:46	1
Colorful-colorless		1	1	3:58 1:41	1:59 3:49	1:55 3:49		1	1:56 3:45			1
Sophisticated-naive	4:40 1:37	1			1		1			1	1	
Strong-weak		1	2:39 1:37		1			1	1			1
Axiomatic-absurd					1		1			1	1	
Direct-circuitous	2	2	2	2	2	2	2	2	2	2	2	2
Certain-uncertain	2	2	2	2	2	2	2	2	2	2	2	2
Precise-vague	2	2	2		2	2	2	2	2	2	2	2
Efficient-inefficient	2	2	2	2	1:48 2:43	2	2	2	2	3:49 2:37	2	2
Consistent-inconsistent	2	2	4:44 2:41	2	2	2	2	2	2	2	3:48 2:40	2
Stable-changeable				2	2	5:47 2:40	2	2	2	2	2	2
Organized-unorganized	3:49 2:44	2			4:50 2:41	2	2	2	2		6:43 2:33	4:44 2:40
Apparent-unapparent					2			2	2			2
Controlled-accidental		6:54 2:45				2	4:42 2:40	4:48 2:36	5:46 2:44			2
Permissive-prohibitive	3	3	3	3	3	3	3	3	3	3		3
Creative-mechanical	3	1:59 3:40	3	3	3	3	3	3	3	3	3	1:48 3:45
Dynamic-static	3		3	3	3	3	3		3	3	3	3
Leading-following	3		3	3	3	3	3	3	1:40 3:32		3	3
Sensitive-insensitive	3	3	3	3	3	3	3		3	3	3	5:51 3:46
Active-passive	3				3		3	3		3	3:64 1:46	
Colorful-colorless	3			3:58 1:41	1:59 3:49	1:55 3:49	3		1:56 3:45	3	3	
Strong-weak			2:39 3:38	3		3	5:47 3:37			3	3	3
Rational-intuitive	4	4	4	4	4	4	4	4	4	4	4	4
Rational-emotional	4	4	4	4	4	4	4	4	4	4	4	4
Probable-improbable		4			4			4	2:40 4:31			3:47 4:35
Axiomatic-absurd	5	5	5	5	1:38 5:36			5	5			5
Probable-improbable	5	4:48 5:47	5	5		5	5			5	5	
Apparent-unapparent	5	5	5	5		5	5			5	5	

* 1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

on 10 concepts. Three other scales had much less consistency in the loadings on the various concepts, and one was included because of its loading on this factor in the four-factor analysis. Factor III (an ACTIVITY factor) had five scales with high loadings on 9 to 11 of the concepts and three scales with scattered loadings on the concepts. It will be noted at this point that the active--passive, colorful--colorless, and strong--weak scales appeared to be pulled between Factor I and Factor III. Factor IV (a COGNITIVE factor) had consistent and high loadings on two scales. Another cluster of scales was clearly identified as a factor on certain concepts, but it appeared to lack the consistency that would enable it to be identified as a factor across all concepts. These scales appeared to describe a comprehensibility or credibility of the concepts being considered. However, because of the small number of scales involved and the small amount of variance being considered, it was understandable that there was less consistency across concepts. Although six factors were extracted for each concept, the small number of scales involved in the last factors extracted prevented the identification of more than four factors that had consistency across the concepts.

Table 3.2 shows similar information to that contained in Table 3.1 except that only five factors were extracted. In this analysis, simple--complex and motivated--aimless more clearly loaded on Factor I than in the six-factor analysis. Also, there was a change in active--passive and colorful--colorless, in that they shifted in the direction of Factor III. No significant change occurred in Factor II, Factor III (with the exception of the two scales mentioned) or Factor IV. The clustering of three scales did not load on as many concepts as in the six-factor analysis.

Table 3.3 consists of information from a four-factor analysis. The pattern of this analysis was quite similar to that of the five-factor analysis, except the cluster of three scales lost its identity. Axiomatic--absurd inconsistently loaded on Factor I, apparent--unapparent rather consistently loaded on Factor II, and probable--improbable inconsistently loaded on Factor IV.

The three-factor analysis had a pattern different from the prior analyses, and it appeared that this analysis forced the data into a structure that over-simplified to the point of losing meaning. On five of the concepts, Factor I and Factor III combined into one very large factor, leaving II and IV virtually the same. On four of the concepts, Factor IV combined with Factor II, leaving I and III very similar to those identified in the other analyses. On two of the concepts, Factor IV split between Factor II and Factor III. On one concept, Factor IV combined with Factor I. An examination of the two-factor analysis showed even less consistency and revealed very little "psychological meaning."

Table 3.4 summarizes the information from the six-factor, five-factor, and four-factor analyses. The column on the left identifies the scales, arranged by the factors identified. The three numbers below each analysis indicate the number of concepts on which there was agreement across concepts; the number of scales that had mixed loadings, yet with comparable loading to the high loading; and the number of concepts on which this scale had a low loading. For example, valuable--worthless consistently loaded high on Factor I

Table 3.2

A Five-factor Analysis of 12 Abstract Concepts with 30 Scales

Scale	Concept * 1	2	3	4	5	6	7	8	9	10	11	12
Valuable-worthless	1	1	1	1	1	1	1	1	1	1		1
Vigorous-feeble	1	1	1	1	1	1	1	1		1		1
Interesting-boring	1	1	1	1	1	1	3:48 1:46	1		1		1
Meaningful-meaningless		1	1	1	1		3:50 1:42	1	1	1		
Complex-simple	1	1	1	1	1	1	1	1	3:55 1:45	1		1
Motivated-aimless	1	1	1	1	1	1	1	1	1	2:50 1:44	1	1
Active-passive		1:56 3:45	1	1						3:59 1:50	1	
Colorful-colorless		1	1	3:55 1:45	1			1		3:64 1:53	5:28 1:26	3:66 1:47
Sophisticated-naive		1				1	1	1	1	1	1	1
Strong-weak		1	1:38 2:40		1			1	1:32 3:43	3:55 1:41		
Axiomatic-absurd		5:39 1:29			1	1	1		1	1	1	1
Direct-circuitous	2	2	2	2	2	2	2	2	2	2	2	2
Certain-uncertain	2	2	2	2	2	2	2	2	2	2	2	2
Precise-vague	2	2	2	2	2	2	2	2	2	2	2	2
Efficient-inefficient	2	2	2	2	1:46 2:44	2	2	2	2	2	2	2
Consistent-inconsistent	2	2	3:44 2:44	2	2	2	2	2	2	2		2
Stable-changeable				2	2	5:41 2:33	2	2	2		2	2
Organized-unorganized	2	2	1:46 2:33	5:46 2:40	5:49 2:41	2	5:40 2:37	4:46 2:34	2	2		
Apparent-unapparent			2		2			2	2	2	2	2
Controlled-accidental	2	2				2	4:41 2:34		2	2		4:40 2:38
Permissive-prohibitive	3	3	3	3	3	3	3	3		3		3
Creative-mechanical	3	3	3	3	3	3	3	3	3	3		3
Dynamic-static	3	3	3	3	3	3	3	1:46 3:45	3	3		3
Leading-following	3	1:40 3:36	3	3	3	3	3	3	3	3		3
Sensitive-insensitive	3	3	3	3	3	3	3	5:43 3:40	3	3		3
Active-passive	3	1:56 3:45			3	3	3	3	3	3:59 1:50		3
Colorful-colorless	3	1:58 3:49		3	1:60 3:49	3	3		3	3		3
Strong-weak	3		2:40 3:39	3		3			3	3		3
Rational-intuitive		4	4	4	4	4	4	4	4	4	4	4
Rational-emotional		4	4	4	4	4	4	4	4	4	4	4
Probable-improbable		4			4			5:56 4:41		4		4
Axiomatic-absurd	5	5	5:33 2:43	5	5:32 1:39				5			
Probable-improbable	5			5		5	5	5	2:40 5:33		5	
Apparent-unapparent	5	5		5		5	5	2:37 5:35			1:44 5:38	

* 1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

Table 3.3

A Four-factor Analysis of 12 Abstract Concepts with 30 Scales

	Concept *											
Scale	1	2	3	4	5	6	7	8	9	10	11	12
Valuable-worthless	1	1	1	1	1	1	1	1	1	1	1	1
Vigorous-feeble	1	1	1	1	1	1	1	1	1	1	4:27 1:22	1
Interesting-boring	1	1	1	1	1	1	1	1	1	1		1
Meaningful-meaningless		1	1	1	1	3:48 1:32	1	1	1	1		
Complex-simple	1	1	1	1	1	1	1	1		1	1	1
Motivated-aimless	1	1	1	1	1	1	1	1	1			1
Active-passive		1	1	1			1		1	1		
Colorful-colorless		1	1	3:57 1:40	1			1	1	1		
Sophisticated-naive	1	1		2:35 1:34	1	1	1	1	1	2:53 1:48	1	1
Strong-weak		1	1	3:50 1:38	1	3:42 1:31	1	1	1	1	1	
Axiomatic-absurd	2:35 1:35	4:37 1:28			1	1	1					1
Direct-circuitous	2	2	2	2	2	2	2	2	2	2	2	2
Certain-uncertain	2	2	2	2	2	2	2	2	2	2	2	2
Precise-vague	2	2	2	2	2	2	2	2	2	2	2	2
Efficient-inefficient	2	2	2	2	1:46 2:44	2	2	1:53 2:45	2	1:61 2:57	2	2
Consistent-inconsistent	2	2	2	2	2	2	2	2	2	3:46 2:43		2
Stable-changeable				2	2	2	2		2		2	2
Organized-unorganized	2	2	4:46 2:39	2	4:44 2:39	2	3:47 2:42	2	2	2		4:48 2:36
Apparent-unapparent	2	4:44 2:31	2	2	2	2	1:40 2:34	2	2	2		2
Controlled-accidental	2	2		2		2	3:47 2:38	2	2	2		4:43 2:35
Permissive-prohibitive	3	3	4:33 3:32	3	3	3	3	3			3	3
Creative-mechanical	3	3		3	3	3	3	3			3	3
Dynamic-static	3	3		3	3	3	3	1:46 3:45	1:38 3:33		3	3
Leading-following	3	1:38 3:38		3	3	3	3	3			3	3
Sensitive-insensitive	3	3		3	3	3	3	3				3
Active-passive	3	1:53 3:49		1:49 3:39	3	3	1:38 3:36	3			3	3
Colorful-colorless	3	1:55 3:53		3	1:59 3:51	3	3				3	3
Strong-weak	3			3		3						3
Rational-intuitive		4	4	4	4	4	4	2:45 4:34	4	4	4	4
Rational-emotional		4	4	4	4	4	4	2:43 4:38	4	4	4	4
Probable-improbable		4			4	4	4			4		4

* 1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

Table 3.4

Six-factor, Five-factor, Four-factor Analyses

of 12 Abstract Concepts with 30 Scales

Scale	Six-factor			Five-factor			Four-factor		
Valuable-worthless	11	1	0	11	0	1	12	0	0
Vigorous-feeble	10	2	0	10	0	2	11	1	0
Interesting-boring	11	1	0	9	1	2	11	0	1
Meaningful-meaningless	11	0	1-	7	1	4	8	1	3
Complex-simple	8	2	2	10	1	1	11	0	1
Motivated-aimless	4	6	2	11	1	0	10	0	2
Active-passive	6	1	5	3	2	7	6	0	6
Colorful-colorless	4	4	4	4	4	4	6	1	5
Sophisticated-naive	5	1	6	8	0	4	9	2	1
Strong-weak	5	1	6	3	3	6	8	2	2
Axiomatic-absurd	4	0	8	7	1	4	4	2	6
Direct-circuitous	12	0	0	12	0	0	12	0	0
Certain-uncertain	12	0	0	12	0	0	12	0	0
Precise-vague	11	0	1	12	0	0	12	0	0
Efficient-inefficient	10	2	0	11	1	0	9	3	0
Consistent-inconsistent	10	2	0	10	1	1	10	1	1
Stable-changeable	8	1	3	7	1	4	7	0	5
Organized-unorganized	5	4	3	5	5	2	7	4	1
Apparent-unapparent	4	0	8	7	0	5	9	2	1
Controlled-accidental	2	4	6	5	2	5	7	2	3
Permissive-prohibitive	11	0	1	10	0	2	9	1	2
Creative-mechanical	10	2	0	11	0	1	9	0	3
Dynamic-static	10	0	2	10	1	1	8	2	2
Leading-following	9	1	2	10	1	1	8	1	3
Sensitive-insensitive	10	1	1	10	1	1	8	0	4
Active-passive	5	1	6	7	2	3	6	3	3
Colorful-colorless	4	4	4	7	2	3	6	2	4
Strong-weak	5	2	5	6	1	5	4	0	8
Rational-intuitive	12	0	0	11	0	1	10	1	1
Rational-emotional	12	0	0	11	0	1	10	1	1
Probable-improbable	3	2	7	4	1	7	6	0	6
Axiomatic-absurd	7	1	4	4	2	6			
Probable-improbable	7	1	4	6	1	5			
Apparent-unapparent	8	0	4	5	2	5			

on 11 of the concepts on the six-factor analysis, had loadings on Factor I and Factor III that were comparable on one of the concepts and did not load low on Factor I on any of the concepts.

These analyses led to the consideration of which scales should be included in the various factors. In Factor I, the first four scales had considerable consistency across the concepts for the six-factor, five-factor, and four-factor analyses. Likewise, the next two scales had consistency across the concepts in the five-factor and the four-factor analyses. These six scales (valuable--worthless, vigorous--feeble, interesting--boring, meaningful--meaningless, complex--simple, and motivated--aimless) were considered to be scales that identified Factor I, labeled EVALUATIVE.

In Factor II, labeled POTENCY, the first five scales (direct--circuitous, certain--uncertain, precise--vague, efficient--inefficient, and consistent--inconsistent) appeared to identify the factor, because of their consistency in all of the first three analyses. In Factor III, named ACTIVITY, the first five scales (permissive--prohibitive, creative--mechanical, dynamic--static, leading--following, and sensitive--insensitive) also identified the factor. It is interesting to note that active--passive and colorful--colorless were evenly divided between Factor I and Factor III in the four-factor analysis, indicating the lack of clarity of the factors insofar as these scales were concerned. Factor IV, a COGNITIVE factor consisting of only two scales (rational--intuitive and rational--emotional), continued its consistency through the five-factor analysis, and lost only a slight amount of this consistency in the four-factor analysis. The clustering of scales, of course, lost its identity in the four-factor analysis, and none of the scales had consistent loadings on a single factor across all of the concepts. This clustering was not, therefore, considered to be a factor.

The factors identified in this procedure were then used for determining the factor scores necessary for comparing distances between the concepts in the four-dimensional space. Factor scores were computed by averaging the scores on the scales within the factor and the distance was computed by using the generalized distance score, D, discussed by Osgood and Suci (1952) and Cronbach and Gleser (1953). (The option of using a factor loading to weight the score was no longer available, unless some average loading across the 12 concepts weighted in some manner were to be used.)

Procedure for the Human Variables

The same procedure described for determining the factor structure of the abstract concepts was followed with the human variables. Table 3.5 shows the six-factor analysis for the eight human variables, Table 3.6 shows the five-factor analysis, and Table 3.7 shows the four-factor analysis. As with the abstract concepts, the three-factor and two-factor analyses appeared to force the data into a meaningless, over-simplified structure. Table 3.8 summarizes the six-factor, the five-factor, and the four-factor analyses, showing the number of high loadings, mixed loadings, and no loadings. The three factors that had scales consistent enough for comparison across all concepts were:

Table 3.5

A Six-factor Analysis of 8 Human Concepts with 26 Scales

Scale	Concept *							
	1	2	3	4	5	6	7	8
Pleasant	1	1	1	1	1	2:64 1:44	1	4:56 1:39
Active	1	1	1	1	1	1	1	4:54 1:44
Creative	1	1	1	1	1	1	1	1
Competent	1	1	1	3:42 1:37	1	1	1	1
Colorful	1	1	1	1	1	1	1	
Curious	1	1	1	1	1		1	1
Sensitive	1	1	1	1	1		1	1
Optimistic	1	1	1	1	6:47 1:38		2:43 1:36	1
Obedient	2		2	2	2		2	2
Sincere	2				2	2	2	2
Respectful	1:66 2:40		1:56 2:47	2	2	2	2	2
Unselfish	2	2	2			3:53 2:41	2	1:40 2:34
Contented	2	2			3:46 2:44		2	2
Organized	2:52 5:45	3:49 2:43					2	3:51 2:40
Aggressive	3	3	3	3	3		3	3
Tough		3	3	3	4:45 3:37		3	3
Sophisticated		3	3	3	3		3	3

* 1 = Pupils

2 = Parents

3 = Teacher

4 = Administrators

5 = Human Beings

6 = Education Instructors

7 = Myself

8 = Society

Table 3.6

A Five-factor Analysis of 8 Human Concepts with 26 Scales

Scale	Concept * 1	2	3	4	5	6	7	8
Pleasant	1	1	1	1	1	1	1	
Active	3:57 1:46	1	1	1	1	1	1	
Creative	3:51 1:46	1	1	1	1	1	1	
Competent	1	1	1	2:50 1:44	1	1	1	1
Colorful	1	1	1	1		1	1	
Curious	1	1	1	1	1	2:57 1:44	1	1
Sensitive	1	1	1	1	1	2:60 1:43	3:48 1:45	1
Optimistic	1	1	1	1			2:44 1:37	1
Obedient	2	2	2	2	2		2	2
Sincere	2	1:48 2:32		2	2	2	2	
Respectful	1:63 2:42	2	1:56 2:50	2	3:52 2:46	2	2	
Unselfish	2	2	2	2		2	2	1:46 2:38
Contented	2	2			3:55 2:46		2	2
Organized	2	2					2	
Aggressive		3	3	3	3		3	3
Tough	3	3	3	3	3		4:56 3:46	3
Sophisticated	3	3	3	3	3		3	3

* 1 = Pupils	5 = Human Beings
2 = Parents	6 = Education Instructors
3 = Teacher	7 = Myself
4 = Administrators	8 = Society

Table 3.7

A Four-factor Analysis of 8 Human Concepts with 26 Scales

Scale	Concept *							
	1	2	3	4	5	6	7	8
Pleasant	1	2:29 1:28	1		1	1	1	1
Active	1	1	1	1	1	1	1	3:52 1:49
Creative	1	1	1	1	1	1	1	1
Competent	1	1	1	3:62 1:41	1	1	1	1
Colorful	1	1	1	1		1	1	3:57 1:40
Curious	1	1	1	1	1	1	1	1
Sensitive	1	1	1	1	1	2:59 1:40		1
Optimistic	1	1	1	1			2:39 1:33	1
Obedient	2	2	2	2	2		2	2
Sincere	2			2	2	2	2	2
Respectful	2	2	1:55 2:46	2	2	2	3:70 2:40	1:52 2:38
Unselfish	2	2	2	2	3:57 2:42	2	2	2
Contented	2	2					2	2
Organized	3:52 2:46	3:59 2:39					2	2
Aggressive		3	3	3	3			3
Tough	3	3	3	3	3		3	3
Sophisticated	3	3	3	3	3		1:34 3:31	4:47 3:36

* 1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

Table 3.8

Six-factor, Five-factor, Four-factor Analyses

of 8 Human Concepts with 26 Scales

Scale	Six-factor			Five-factor			Four-factor		
Pleasant	6	2	0	7	0	1	6	1	1
Active	7	1	0	6	1	1	7	1	0
Creative	8	0	0	6	1	1	8	0	0
Competent	7	1	0	7	1	0	7	1	0
Colorful	7	0	1	6	0	2	6	1	1
Curious	7	0	1	7	1	0	8	0	0
Sensitive	7	0	1	6	2	0	6	1	1
Optimistic	5	2	1	5	1	2	5	1	2
Obedient	6	0	2	7	0	1	7	0	1
Sincere	5	0	3	5	1	2	6	0	2
Respectful	5	2	1	4	3	1	5	3	0
Unselfish	[illegible]	[illegible]	[illegible]	6	1	1	7	1	0
Contented	4	1	3	4	1	3	4	0	4
Organized	1	3	4	3	0	5	2	2	4
Aggressive	7	0	1	6	0	2	5	0	3
Tough	5	1	2	6	1	1	7	0	1
Sophisticated	6	0	2	7	0	1	5	2	1

Factor I. This factor was composed of the following scales: pleasant--unpleasant, active--passive, creative--mechanical, competent--incompetent, colorful--colorless, curious--indifferent, sensitive--insensitive, optimistic--pessimistic. This factor appears to have a mixture of several elements similar to those identified in previous studies. For example, it resembles Ryans' "originality" factor (Ryans, 1960) yet also his "buoyancy" factor. It has some of Osgood's (Osgood, et al., 1957) "activity" factor in it. It also resembles a "social utility" factor discussed by Kelley (see Harmon, 1960) which is related to vocational success. However, because of the close resemblance to Osgood's "evaluative" factor, it was labeled EVALUATIVE.

Factor II. This factor was composed of the following scales: obedient--disobedient, sincere--insincere, respectful--disrespectful, unselfish--selfish. As noted in Table 3.8, this factor also had loadings on contented--discontented and organized--disorganized. It resembles Kelley's "well-being" or "personal happiness" factor, Ryans' "responsiveness" factor, and Halpin and Croft's (1962) "consideration" factor. It also resembles Osgood's "stability" and "receptivity" factors. It was labeled RESPONSIVENESS.

Factor III. This factor was composed of the following scales: aggressive--defensive, tough--fragile, and sophisticated--naive. This factor resembles the "potency" factor discussed by Osgood and was labeled POTENCY.

Summary

This chapter outlined a procedure which had as its purpose the analysis of data that was characterized by four types of classifications: entities, attributes, occasions, and conditions. Students, scales, time 1 and time 2, and concepts, respectively, represented these four classification types in the data analyzed. The development of this procedure was necessary in order to determine if the concepts being studied had common factors or dimensions. Separate analyses were made for the abstract and the human concepts.

The steps followed were: (a) the data collected at time 1 and time 2 were combined, thereby eliminating the occasion classification; (b) six-factor, five-factor, four-factor, three-factor, and two-factor analyses of the scales and student matrices for each of the concepts were completed; (c) the six-factor analysis across all of the concepts was examined, seeking scales that were consistent across concepts; (d) the five-factor, four-factor, three-factor, and two-factor analyses were examined for the same purpose; (e) the scales that loaded high on the same factor over the set of concepts and which were independent of each other were identified.

The disadvantages of the procedure center in the judgment aspect of the final identification of the scales within each factor and the laboriousness of the handling of the factor loadings on completion of the factor analyses. The advantages were manageability and simplicity in comparison with k-dimensional matrix algebra.

Results of the analyses allowed the identification of four factors for comparison of the twelve abstract concepts. The four factors were labeled EVALUATIVE, POTENCY, ACTIVITY, and COGNITIVE.

Three factors were identified for comparison of the eight human concepts. These three factors were labeled EVALUATIVE, RESPONSIVENESS, and POTENCY.

The scales that served to identify the factors of the concepts were used in the computations of factor scores. The factor scores were necessary to compare meanings of concepts and to determine whether changes in meaning occurred. The results of the comparison of meanings are reported in Chapter IV, and the results of the changes in meaning are reported in Chapter V.

CHAPTER IV

DIFFERENCES IN MEANINGS OF THE CONCEPTS STUDIED

This chapter describes the differences in meaning that were found among the twelve abstract and eight human concepts before and after an initial course in education. The information regarding the meaning of this specific class of concepts should assist professors in relating students' meanings of concepts to their own meanings of the concepts and should promote adaptations that will facilitate communication. The degree of identification the students have with the profession may be noted by comparing the meanings of pupils, teacher, and myself.

Procedure for Measuring Differences

The hypotheses to be tested in this part of the study were stated in null form:

H2. At the beginning of a one-quarter course in education, students perceive no significant difference in the distance between each pair of the 20 concepts in the semantic space as measured by a semantic differential.

H3. At the end of a one-quarter course in education, students perceive no significant difference in the distance between each pair of the 20 concepts in the semantic space as measured by a semantic differential.

H4. Beginning students perceive no significant difference in the distance between a given concept, when measured at the beginning of a course in education, and any of 19 other educational concepts, when measured at the end of the course, in the semantic space as measured by a semantic differential.

To determine the nature of the semantic space within which the distances were to be measured, a procedure was developed which identified a set of factors that were common to the concepts being compared. Separate factors were determined for the abstract and the human concepts; because of this, each of the three hypotheses was tested separately for the abstract and the human concepts. Use of the procedure described in Chapter III for determining factors common to the concepts being compared resulted in the identification of three factors consistent enough for comparison across all human concepts; the three factors were EVALUATIVE, RESPONSIVENESS, and POTENCY. The abstract concepts had four factors consistent enough for comparison; they were EVALUATIVE, POTENCY, ACTIVITY, and COGNITIVE.

Data for the Human Concepts

Factor scores were computed for each individual on each concept and occasion by summing his score on the scales involved in the factor and dividing by the number of scales in the factor. A set of three factor scores indicated a location in the three-dimensional semantic space of the meaning of a concept for an individual. A set of three *mean* factor scores located the meaning for a group, while a "cloud" of points represented the distribution about this point. Table 4.1 shows the mean factor scores on Factor I, EVALUATIVE, for the experimental group on each of the eight human concepts prior to treatment (t1). A Kruskal-Wallis analysis of variance indicated that the eight concepts were different beyond the .001 level of significance. Following the Kruskal-Wallis test, a Wilcoxon matched-pair, signed rank test was computed for all possible combinations, and the concepts that were significantly different are noted in Table 4.1. The same procedure was followed for the other two dimensions, and the results are noted in Table 4.2 and Table 4.3. The Kruskal-Wallis test indicated that the concepts were different beyond the .001 level of significance in these two dimensions also.

If there was a significant difference between any two concepts on any one of the three dimensions of the semantic space, then the distance between the two concepts in the space was significant. Distances between the eight concepts were computed using a generalized distance formula (Osgood, 1957), and the distances are noted in Table 4.4. All concepts were significantly different at the .001 level of significance in at least one of the three dimensions. Hypothesis 2 was rejected for the human concepts.

Table 4.5 shows the mean factor scores on Factor I, EVALUATIVE, for the experimental group on each of the eight human concepts following treatment (t2). A Kruskal-Wallis test indicated that the eight concepts were different beyond the .001 level of significance. Following the Kruskal-Wallis test, a Wilcoxon matched-pair, signed rank test was computed for all possible combinations, and the concepts that were significantly different are noted in Table 4.5. The same procedure was followed for the other two dimensions, and the results are noted in Table 4.6 and Table 4.7. The Kruskal-Wallis test indicated that the concepts were different beyond the .001 level of significance in these two dimensions also.

Distances between the eight concepts were computed and the distances are noted in Table 4.8. All concepts were different at the .001 level of significance in at least one of the three dimensions. Hypothesis 3 was rejected for the human concepts.

Hypothesis 4 was established to compare the differences between a given concept at t1 and all other comparable concepts at t2. The results of making the comparisons of the human concepts on mean factor scores on Factor I, EVALUATIVE, are shown in Table 4.9; significant differences are noted as determined by the Wilcoxon test. Tables 4.10 and 4.11 show the results on Factor II, RESPONSIVENESS, and Factor III, POTENCY. Table 4.12 shows the distances between each concept at t1 and all other concepts at t2. All concepts except *parents* and *education instructors* were different at the .001 level of significance in at least one of the three dimensions, indicating the distances were significantly different. *Parents* and *education instructors* were significantly different at the .01 level in Factor II. Hypothesis 4 was rejected for the human concepts.

Table 4.1

Differences, d_{ij}, of Mean EVALUATIVE Factor Scores of Eight Human Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8
1. Pupils	2.34								
2. Parents	2.54	.20[b]							
3. Teacher	2.15	.19[c]	.39[c]						
4. Administrators	2.95	.61[c]	.41	.80[c]					
5. Human Beings	2.43	.09	.11[a]	.28[c]	.52[c]				
6. Education Instructors	2.65	.31[c]	.11	.50[c]	.30[c]	.22[b]			
7. Myself	2.16	.18[c]	.38[c]	.01	.79[c]	.27[c]	.49[c]		
8. Society	2.95	.61[c]	.41[c]	.80[c]	.00	.52[c]	.30[c]	.79[c]	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.2

Differences, d_{ij}, of Mean RESPONSIVENESS Factor Scores of Eight Human Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8
1. Pupils	3.03								
2. Parents	2.56	.47[c]							
3. Teacher	2.35	.68[c]	.21[b]						
4. Administrators	2.74	.29[c]	.18[b]	.39[c]					
5. Human Beings	3.30	.27[c]	.74[c]	.95[c]	.56[c]				
6. Education Instructors	2.64	.39[c]	.08	.29[c]	.10	.66[c]			
7. Myself	2.38	.65[c]	.18[b]	.03	.36[c]	.92[c]	.26[c]		
8. Society	3.56	.53[c]	1.00[c]	1.21[c]	.82[c]	.26[c]	.92[c]	1.18[c]	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.3

Differences, d_{ij}, of Mean POTENCY Factor Scores of Eight Human Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8
1. Pupils	3.67								
2. Parents	3.29	.04^c							
3. Teacher	2.71	.96^c	.58^c						
4. Administrators	2.86	.81^c	.43^c	.15					
5. Human Beings	3.40	.27^c	.11	.69^c	.54^c				
6. Education Instructors	2.96	.71^c	.33^c	.25^c	.10^a	.44^c			
7. Myself	3.04	.63^c	.25^c	.33^c	.18^a	.36^c	.08		
8. Society	3.14	.53^c	.15^a	.43^c	.28^c	.26^c	.18^b	.10	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.4

Semantic Distances, D_{il}, Between Eight Human Concepts as Determined by the Experimental Group Before Treatment

	Concepts *							
Concepts	1	2	3	4	5	6	7	8
1. Pupils								
2. Parents	.51							
3. Teacher	1.19	.73						
4. Administrators	1.05	.62	.90					
5. Human Beings	.39	.75	1.21	.94				
6. Education Instructors	.86	.35	.63	.36	.82			
7. Myself	.93	.50	.58	.89	1.03	.56		
8. Society	.96	1.09	1.51	.87	.63	.99	1.43	

* All concepts significantly different at .001 level

Table 4.5

Differences, $d_{(i)(1)}$, of Mean EVALUATIVE Factor Scores of Eight Human Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8
1. Pupils	2.18								
2. Parents	2.58	.40[c]							
3. Teacher	2.15	.03	.43[c]						
4. Administrators	2.70	.52[c]	.12	.55[c]					
5. Human Beings	2.37	.19[c]	.21[c]	.21[c]	.33[c]				
6. Education Instructors	2.69	.51[c]	.11	.54[c]	.01	.32[c]			
7. Myself	2.10	.08	.48[c]	.05	.60[c]	.27[c]	.59[c]		
8. Society	2.84	.66[c]	.74[c]	.69[c]	.14[a]	.47[c]	.15[b]	.74[c]	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.6

Differences, $d_{(i)(j)}$, of Mean RESPONSIVENESS Factor Scores of Eight Human Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8
1. Pupils	2.88								
2. Parents	2.72	$.16^b$							
3. Teacher	2.35	$.53^c$	$.37^c$						
4. Administrators	2.61	$.27^c$	$.11^a$	$.26^c$					
5. Human Beings	3.11	$.23^c$	$.39^c$	$.76^c$	$.50^c$				
6. Education Instructors	2.63	$.25^c$	.09	$.28^c$	.02	$.48^c$			
7. Myself	2.38	$.50^c$	$.34^c$	.03	$.23^c$	$.73^c$	$.25^c$		
8. Society	3.41	$.53^c$	$.69^c$	1.06^c	$.80^c$	$.30^c$	$.78^c$	1.03^c	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.7

Differences, $d_{(i)(j)}$, of Mean POTENCY Factor Scores of Eight Human Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts							
		1	2	3	4	5	6	7	8
1. Pupils	3.45								
2. Parents	3.23	.22^{c}							
3. Teacher	2.75	.70^{c}	.48^{c}						
4. Administrators	2.73	.72^{c}	.50^{c}	.02					
5. Human Beings	3.29	.16^{b}	.06	.54^{c}	.56^{c}				
6. Education Instructors	3.09	.36^{c}	.14^{a}	.34^{c}	.36^{c}	.20^{a}			
7. Myself	2.98	.47^{c}	.25^{c}	.23^{c}	.25^{c}	.31^{c}	.11		
8. Society	3.12	.33^{c}	.11^{a}	.37^{c}	.39^{c}	.17^{c}	.03	.14^{a}	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.8

Semantic Distances, $D_{(i)(j)}$, Between Eight Human Concepts as Determined by the Experimental Group After Treatment

Concepts	Concepts * 1	2	3	4	5	6	7	8
1. Pupils								
2. Parents	.49							
3. Teacher	.88	.74						
4. Administrators	.93	.53	.61					
5. Human Beings	.35	.45	.97	.82				
6. Education Instructors	.67	.18	.70	.36	.61			
7. Myself	.69	.63	.24	.69	.84	.65		
8. Society	.91	1.01	1.31	.89	.57	.79	1.27	

* All concepts significantly different at .001 level

Table 4.9

Differences, $d_{i(1)}$, of Mean EVALUATIVE Factor Scores of Eight Human Concepts by the Experimental Group Before and After Treatment

Concepts	Mean Factor Scores	1	2	3	4	5	6	7	8
		time 2							
		2.18	2.58	2.15	2.70	2.37	2.69	2.10	2.84
	time 1								
1. Pupils	2.34		.24^c	.19^c	.36^c	.03	.35^c	.24^c	.50^c
2. Parents	2.54	.36^c		.39^c	.16^a	.17^b	.15	.44^c	.29^c
3. Teacher	2.15	.03	.43^c		.55^c	.22^c	.54^c	.05	.69^c
4. Administrators	2.95	.77^c	.37^c	.80^c		.58^c	.26^c	.85^c	.11
5. Human Beings	2.43	.25	.15^b	.28^c	.27^c		.26^b	.33^c	.41^c
6. Education Instructors	2.65	.47^c	.07	.50^c	.05	.28^c		.55^c	.19^b
7. Myself	2.16	.02	.42^c	.01	.54^c	.21^c	.53^c		.68^c
8. Society	2.95	.77^c	.37^c	.80^c	.25^c	.58^c	.26^c	.85^c	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.10

Differences, $d_{i(i)}$, of Mean RESPONSIVENESS Factor Scores of Eight Human Concepts by the Experimental Group Before and After Treatment

Concepts	Mean Factor Scores	Concepts 1	2	3	4	5	6	7	8
		time 2							
		2.88	2.72	2.35	2.61	3.11	2.63	2.38	3.41
	time 1								
1. Pupils	3.03		$.31^{c}$	$.68^{c}$	$.42^{c}$	.08	$.40^{c}$	$.65^{c}$	$.38^{c}$
2. Parents	2.56	$.32^{c}$		$.21^{c}$	.05	$.55^{c}$	.07	$.18^{b}$	$.85^{c}$
3. Teacher	2.35	$.53^{c}$	$.37^{c}$		$.26^{c}$	$.76^{c}$	$.28^{c}$	.03	1.06^{c}
4. Administrators	2.74	$.14^{a}$	.02	$.39^{c}$		$.37^{c}$	$.11^{a}$	$.36^{c}$	$.67^{c}$
5. Human Beings	3.30	$.42^{c}$	$.58^{c}$	$.95^{c}$	$.69^{c}$		$.67^{c}$	$.92^{c}$	$.11^{a}$
6. Education Instructors	2.64	$.24^{c}$	.08	$.29^{c}$	.03	$.47^{c}$		$.26^{c}$	$.77^{c}$
7. Myself	2.38	$.50^{c}$	$.34^{c}$	.03	$.23^{c}$	$.73^{c}$	$.25^{c}$		1.03^{c}
8. Society	3.56	$.68^{c}$	$.84^{c}$	1.21^{c}	$.95^{c}$	$.45^{c}$	$.93^{c}$	1.18^{c}	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.11

Differences, $d_{i(1)}$, of Mean POTENCY Factor Scores of Eight Human Concepts by the Experimental Group Before and After Treatment

		Concepts							
		1	2	3	4	5	6	7	8
	Mean Factor	time 2							
Concepts	Scores	3.45	3.23	2.75	2.73	3.29	3.09	2.98	3.12
	time 1								
1. Pupils	3.67		$.44^c$	$.92^c$	$.94^c$	$.38^c$	$.58^c$	$.69^c$	$.55^c$
2. Parents	3.29	$.16^a$		$.54^c$	$.56^c$	.00	$.20^b$	$.31^c$	$.17^a$
3. Teacher	2.71	$.74^c$	$.52^c$		.02	$.58^c$	$.38^c$	$.27^c$	$.41^c$
4. Administrators	2.86	$.59^c$	$.37^c$	.11		$.43^c$	$.23^c$	.12	$.26^c$
5. Human Beings	3.40	.05	$.17^a$	$.65^c$	$.67^c$		$.31^c$	$.42^c$	$.28^c$
6. Education Instructors	2.96	$.49^c$	$.27^c$	$.21^c$	$.23^c$	$.33^c$		.02	$.16^a$
7. Myself	3.04	$.41^c$	$.19^b$	$.29^c$	$.31^c$	$.25^b$	.05		.08
8. Society	3.14	$.31^c$	.09	$.39^c$	$.41^c$	$.15^a$	.04	$.16^a$	

[a] .05 level of significance

[b] .01 level of significance

[c] .001 level of significance

Table 4.12

Semantic Distances, $D_{i(1)}$, Between Eight Human Concepts as Determined by the Experimental Group Before and After Treatment

Concepts	Concepts *							
	1	2	3	4	5	6	7	8
1. Pupils		.19	1.16	1.09	.12	.23	.31	.26
2. Parents	.24		.22	.19	.18	.25	.18	.29
3. Teacher	.29	.28		.19	.31	.23	.28	1.32
4. Administrators	.31	.17	.28		.28	.12	.29	.23
5. Human Beings	.16	.20	1.19	.17		.23	1.06	.16
6. Education Instructors	.23	.29	.19	.32	.20		.19	.26
7. Myself	.21	.18	.29	.21	.25	.19		1.23
8. Society	.11	.29	1.30	1.06	.23	.31	1.46	

* All concepts significantly different at .001 level except _parents_ and _education_ _instructors_ which were significantly different at the .01 level in Factor II.

Figure 4.1 shows the location of the mean factor scores of the eight human concepts on a section of the seven point scale for all three factors for the experimental group. The top line in the figure shows the factor scores for the EVALUATIVE dimension, the middle line the RESPONSIVENESS factor, and the lower line the POTENCY dimension. The scores above the line in each case are measures obtained before the course, and scores below the line are measures obtained following the course. A dash between numbers of the concepts (e.g., 3-7 in Factor I) indicates no significant difference between the concepts. For the experimental group, Figure 1 therefore indicates: (a) which concepts were significantly different, (b) in which dimension they were different, and (c) at what time they were different. Figure 1 also shows that the mean factor scores for all concepts were in the same general vicinity (between 2.0 and 4.0) in all three dimensions.

Discussion of Differences in the Human Concepts

This study indicated that beginning students perceived the eight human concepts as significantly different at t1 and t2. Although the eight concepts studied were in the same general vicinity in the semantic space, the semantic differential appeared sensitive enough to distinguish the dimensions within which the concepts differed. At t1, the self-concept, *myself*, was not significantly different from *teacher* in the EVALUATIVE and RESPONSIVENESS dimensions, but *teacher* was rated more potent than *myself* in the POTENCY dimension. An interpretation of this might be that these Ss perceived themselves as being as good and as responsive as teachers, but without the strength of teachers in the sense of being able to influence or have control over others. It would be interesting to know whether this perception will change as the Ss continue their education to become teachers and if so whether the change will be gradual and constant. It is quite possible that their identification with the role of the teacher would not be complete until the role is consummated, and the change in perception might occur only at the point of the transition from student to teacher. Or, the change might be gradual yet directly related to the amount of contact with teachers. (For example, more rapid during the practice teaching experience.)

Another interesting result of comparing the meaning of the human concepts was that no difference existed between *myself* and *education instructors* and *myself* and *society* in the POTENCY dimension.

Data for the Abstract Concepts

Factor scores for the abstract concepts were computed in the same manner as for the human concepts. Table 4.13 shows the mean factor scores on Factor I, EVALUATIVE, for the experimental group on each of the 12 abstract concepts prior to treatment (t1). Significant differences of all possible combinations were tested by means of the Wilcoxon test following a Friedman analysis of variance by ranks that indicated the concepts were different beyond the .001 level of significance. Differences between

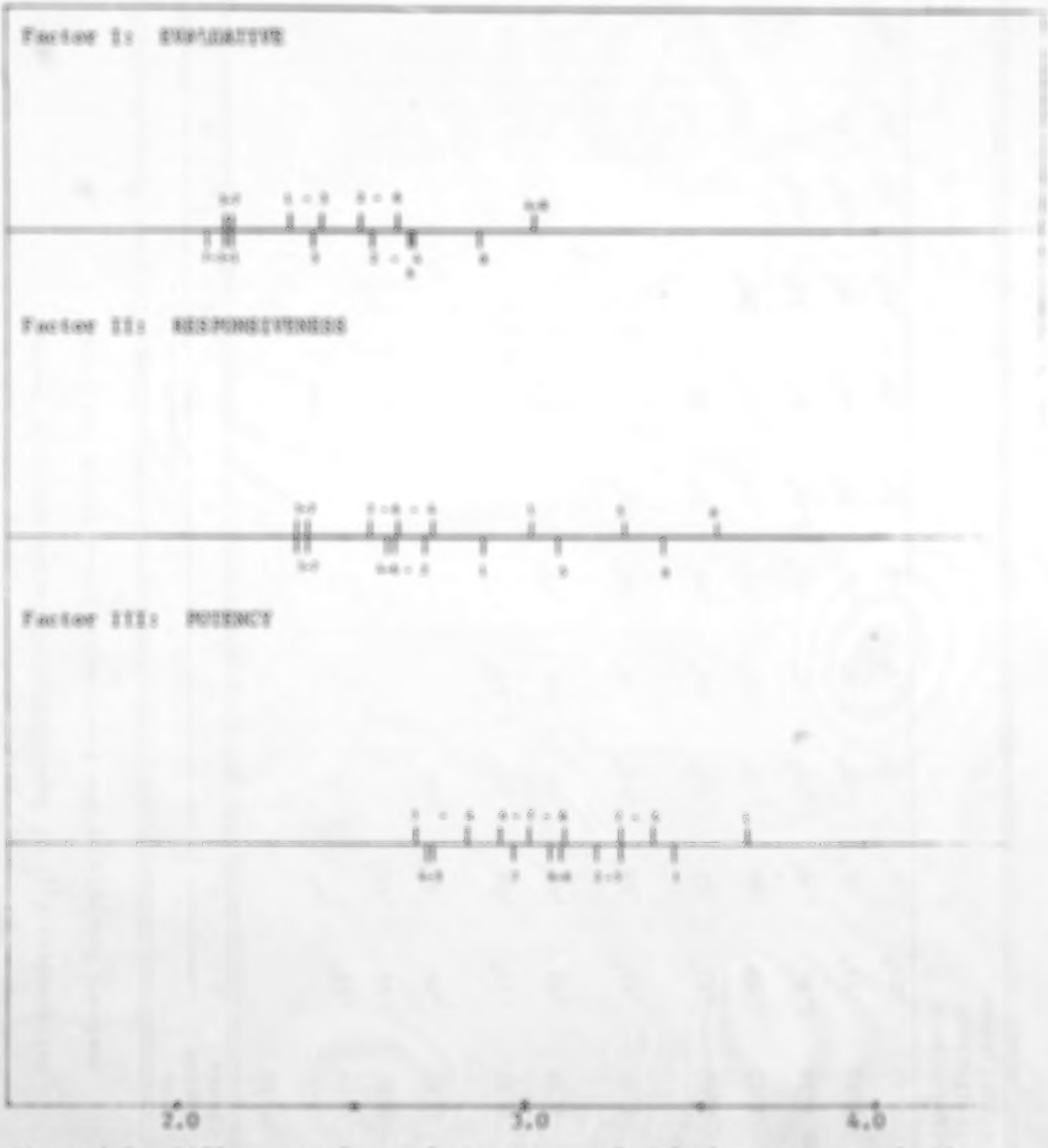

Figure 4.1. Differences of mean factor scores of eight human concepts by the Experimental Group before and after treatment.

Key: 1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

Note: Scores above the line were determined before treatment, below the line were determined after treatment. A line between scores indicates no significant differences on that factor.

Table 4.13

Differences, d_{ij}, of Mean EVALUATIVE Factor Scores of Twelve

Abstract Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	1.54												
2. American Public Schools	2.19	$.65^c$											
3. Cadet Teaching	1.58	.04	$.61^c$										
4. Education	1.63	.09	$.56^c$	.05									
5. Historical Information	2.27	$.73^c$	.08	$.69^c$	$.64^c$								
6. Learning	1.56	.02	$.63^c$	.02	.07	$.71^c$							
7. Philosophical Beliefs	2.01	$.47^c$	$.18^a$	$.43^c$	$.38^c$	$.26^c$	$.45^c$						
8. Classroom Observations	2.07	$.53^c$	.12	$.49^c$	$.44^c$	$.20^b$	$.51^c$	.06					
9. Ethics	2.13	$.59^c$	.06	$.55^c$	$.50^c$	$.14^a$	$.57^c$	$.12^b$	$.06^a$				
10. Education Courses	2.58	1.04^c	$.39^c$	1.00^c	$.95^c$	$.31^a$	1.02^c	$.57^c$	$.51^c$	$.45^c$			
11. Class Decisions	2.45	$.91^c$	$.26^c$	$.87^c$	$.82^c$	$.18^b$	$.89^c$	$.44^c$	$.38^c$	$.32^c$	.13		
12. Psychology	1.83	$.29^c$	$.36^c$	$.25^c$	$.20^c$	$.44^c$	$.27^c$	$.18^c$	$.24^c$	$.30^c$	$.75^c$	$.62^c$	

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

the individual concepts are noted in Table 4.13. The same procedure was followed for the POTENCY, ACTIVITY, and COGNITIVE dimensions, and the results are noted in Table 4.14, Table 4.15, and Table 4.16. The Friedman test indicated that the concepts were different in all four dimensions beyond the .001 level of significance. Distances between the 12 concepts were computed and the distances are noted in Table 4.17. All concepts were different at the .001 level of significance in at least one of the four dimensions. Hypothesis 2 was rejected for the abstract concepts.

Table 4.18 shows the mean factor scores on Factor I, EVALUATIVE, for the experimental group on each of the 12 abstract concepts following treatment (t2). A Friedman analysis of variance by ranks indicated that the 12 concepts were different beyond the .001 level of significance. Following the Friedman test, a Wilcoxon test was computed for all possible combinations, and the concepts that were significantly different are noted in Table 4.18. The same procedure was followed for the POTENCY, ACTIVITY, and COGNITIVE dimensions and the results are noted in Table 4.19, Table 4.20, and Table 4.21. The Friedman test indicated that the concepts were different in all four dimensions beyond the .001 level of significance. Distances between the 12 concepts were computed and are shown in Table 4.22. All concepts except learning and education were different at the .001 level of significance in at least one of the four dimensions. Learning and education were significantly different at the .05 level in Factor I. Hypothesis 3 was rejected for the abstract concepts.

The results of comparing the differences between a given abstract concept at t1 and all other abstract concepts at t2 on the mean factor scores on Factor I, EVALUATIVE, are shown in Table 4.23; significant differences are noted as determined by the Wilcoxon test. Tables 4.24, 4.25, and 4.26 show the results for the POTENCY, ACTIVITY, and COGNITIVE dimensions. Distances between the 12 concepts were computed and are shown in Table 4.27. All concepts were different at the .001 level of significance in at least one of the four dimensions with the following exceptions: cadet teaching at t1 and education at t2, .01 level in Factor II; cadet teaching at t1 and learning at t2, .01 level in Factor III; education at t1 and learning at t2, .05 level in Factor III; learning at t1 and education at t2, .01 level in Factor I and Factor III; education courses at t1 and historical information at t2, .01 level in Factor III. Hypothesis 4 was rejected for the abstract concepts.

Discussion of Differences in the Abstract Concepts

This study indicated that beginning students perceived the 12 abstract concepts as significantly different at t1 and t2. Although there generally was more variation among the main factor scores of the abstract concepts than among the human concepts, the abstract mean factor scores still ranged between 1.5 and 4.0 on the seven point scale.

Two groupings of concepts were of particular interest for discussion: Group One consisted of teaching, cadet teaching, education, learning, and American public schools; Group Two consisted of historical information,

Table 4.14

Differences, d_{i1}, of Mean POTENCY Factor Scores of Twelve

Abstract Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	3	9	10	11	12
1. Teaching	2.64												
2. American Public Schools	3.32	$.68^c$											
3. Cadet Teaching	2.81	$.17^a$	$.51^c$										
4. Education	2.79	$.15^a$	$.53^c$	.02									
5. Historical Information	2.74	.10	$.58^c$	.07	.05								
6. Learning	2.80	$.16^b$	$.52^c$	.01	.01	.06							
7. Philosophical Beliefs	3.87	1.23^c	$.55^c$	1.06^c	1.08^c	1.13^c	1.07^c						
8. Classroom Observations	3.05	$.41^c$	$.27^b$	$.24^c$	$.26^c$	$.31^c$	$.25^c$	$.82^c$					
9. Ethics	3.31	$.67^c$	.01	$.50^c$	$.52^c$	$.57^c$	$.51^c$	$.56^c$	$.26^b$				
10. Education Courses	3.10	$.46^c$	$.22^c$	$.29^c$	$.31^c$	$.36^c$	$.30^c$	$.77^c$	.05	$.21^b$			
11. Class Decisions	3.22	$.58^c$	.10	$.41^c$	$.43^c$	$.48^c$	$.42^c$	$.65^c$	$.17^b$	.09	$.12^a$		
12. Psychology	3.47	$.83^c$	$.15^a$	$.66^c$	$.68^c$	$.73^c$	$.67^c$	$.40^c$	$.42^c$	.16	$.37^c$	$.25^b$	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.15

Differences, d_{il}, of Mean ACTIVITY Factor Scores of Twelve

Abstract Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	2.32												
2. American Public Schools	3.34	1.02[c]											
3. Cadet Teaching	2.74	.42[c]	.60[c]										
4. Education	2.83	.51[c]	.51[c]	.09									
5. Historical Information	3.95	1.63[c]	.61[c]	1.21[c]	1.12[c]								
6. Learning	3.01	.69[c]	.33[c]	.27[c]	.18[c]	.94[c]							
7. Philosophical Beliefs	2.91	.59[c]	.43[c]	.17[a]	.08	1.04[c]	.10						
8. Classroom Observations	3.55	1.23[c]	.21[c]	.81[c]	.72[c]	.40[c]	.54[c]	.64[c]					
9. Ethics	3.55	1.23[c]	.21[b]	.81[c]	.72[c]	.40[c]	.54[c]	.64[c]	.00				
10. Education Courses	3.66	1.34[c]	.32[c]	.92[c]	.83[c]	.29[c]	.65[c]	.75[c]	.11	.11			
11. Class Decisions	3.21	.89[c]	.13	.47[c]	.38[c]	.74[c]	.20[b]	.30[c]	.34[c]	.34[c]	.45[c]		
12. Psychology	2.86	.54[c]	.48[c]	.12[a]	.03	1.09[c]	.15[a]	.05	.69[c]	.69[c]	.80[c]	.35[c]	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.16

Differences, d_{il}, of Mean COGNITIVE Factor Scores of Twelve

Abstract Concepts by the Experimental Group Before Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	3.24												
2. American Public Schools	3.13	.11											
3. Cadet Teaching	3.42	.18^a	.29^b										
4. Education	3.09	.15^a	.04	.33^c									
5. Historical Information	2.99	.25^a	.14	.43^c	.10								
6. Learning	3.21	.03	.08	.21^b	.12	.22^a							
7. Philosophical Beliefs	3.93	.69^c	.80^c	.51^c	.84^c	.94^c	.72^c						
8. Classroom Observations	3.48	.24^b	.35^c	.06	.39^c	.49^c	.27^b	.45^c					
9. Ethics	3.98	.74^c	.85^c	.56^c	.89^c	.99^c	.77^c	.06	.50^c				
10. Education Courses	3.04	.20^a	.09	.38^c	.05	.05	.17^a	.89^c	.44^c	.94^c			
11. Class Decisions	3.58	.34^b	.45^c	.16^a	.49^c	.59^c	.37^b	.35^b	.10	.40^c	.54^c		
12. Psychology	3.39	.15	.26^a	.03	.30^b	.40^b	.18	.54^c	.09	.59^c	.35^c	.19	

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

Table 4.17

Semantic Distances, D_{il}, Between Twelve Abstract Concepts

as Determined by the Experimental Group Before Treatment

Concepts	Concepts * 1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching												
2. American Public Schools	1.39											
3. Cadet Teaching	.49	1.04										
4. Education	.55	.93	.35									
5. Historical Information	1.80	.86	1.46	1.29								
6. Learning	.71	.88	.34	.23	1.20							
7. Philosophical Beliefs	1.60	1.09	1.26	1.21	1.82	1.37						
8. Classroom Observations	1.42	.50	.98	.86	.73	.83	1.13					
9. Ethics	1.69	.88	1.23	1.35	1.22	1.21	.86	.57				
10. Education Courses	1.77	.56	1.44	1.30	.56	1.26	1.51	.68	1.06			
11. Class Decisions	1.44	.54	1.08	1.11	1.08	1.07	.91	.55	.62	.72		
12. Psychology	1.04	.67	.72	.77	1.44	.76	.70	.85	.97	1.21	.78	

* All concepts significantly different at .001 level

Table 4.18

Differences, $d_{(i)(l)}$, of Mean EVALUATIVE Factor Scores of Twelve

Abstract Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	1.54												
2. American Public Schools	2.01	$.47^{c}$											
3. Cadet Teaching	1.58	.04	$.43^{c}$										
4. Education	1.68	$.14^{c}$	$.33^{c}$	$.10^{c}$									
5. Historical Information	2.30	$.76^{c}$	$.29^{c}$	$.72^{c}$	$.62^{c}$								
6. Learning	1.61	$.07^{a}$	$.40^{c}$	.03	$.07^{a}$	$.69^{c}$							
7. Philosophical Beliefs	2.17	$.63^{c}$	$.16^{b}$	$.59^{c}$	$.49^{c}$	$.13^{b}$	$.56^{c}$						
8. Classroom Observations	2.15	$.61^{c}$	$.14^{b}$	$.57^{c}$	$.47^{c}$	$.15^{c}$	$.54^{c}$	.02					
9. Ethics	2.21	$.67^{c}$	$.20^{c}$	$.63^{c}$	$.53^{c}$	.09	$.60^{c}$	.04	.06				
10. Education Courses	2.91	1.37^{c}	$.90^{c}$	1.33^{c}	1.23^{c}	$.61^{c}$	1.30^{c}	$.74^{c}$	$.76^{c}$	$.70^{c}$			
11. Class Decisions	2.44	$.80^{c}$	$.43^{c}$	$.86^{c}$	$.76^{c}$	$.14^{b}$	$.83^{c}$	$.27^{c}$	$.29^{c}$	$.23^{c}$	$.47^{c}$		
12. Psychology	1.95	$.41^{c}$	.06	$.37^{c}$	$.27^{c}$	$.35^{c}$	$.34^{c}$	$.22^{c}$	$.20^{c}$	$.26^{c}$	$.96^{c}$	$.49^{c}$	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.19

Differences, $d_{(i)(1)}$, of Mean POTENCY Factor Scores of Twelve

Abstract Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts											
		1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	2.66												
2. American Public Schools	3.15	$.49^{c}$											
3. Cadet Teaching	2.76	.10	$.39^{c}$										
4. Education	2.98	$.32^{c}$	$.17^{c}$	$.22^{b}$									
5. Historical Information	2.92	$.26^{c}$	$.23^{b}$	$.16^{a}$	.06								
6. Learning	2.89	$.23^{c}$	$.26^{c}$	.13	.09	.03							
7. Philosophical Beliefs	3.84	1.18^{c}	$.69^{c}$	1.08^{c}	$.86^{c}$	$.92^{c}$	$.95^{c}$						
8. Classroom Observations	3.40	$.74^{c}$	$.25^{b}$	$.64^{c}$	$.42^{c}$	$.48^{c}$	$.51^{c}$	$.44^{c}$					
9. Ethics	3.22	$.56^{c}$	.07	$.46^{c}$	$.24^{c}$	$.30^{c}$	$.33^{c}$	$.62^{c}$	.18				
10. Education Courses	3.51	$.87^{c}$	$.36^{c}$	$.75^{c}$	$.53^{c}$	$.59^{c}$	$.62^{c}$	$.33^{c}$	.11	$.29^{c}$			
11. Class Decisions	3.21	$.55^{c}$	.06	$.45^{c}$	$.23^{c}$	$.29^{c}$	$.32^{c}$	$.63^{c}$	$.19^{a}$	.01	$.30^{c}$		
12. Psychology	3.49	$.83^{c}$	$.34^{c}$	$.73^{c}$	$.51^{c}$	$.57^{c}$	$.60^{c}$	$.35^{c}$	.09	$.27^{b}$	.02	$.28^{c}$	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.20

Differences, $d_{(i)(1)}$, of Mean ACTIVITY Factor Scores of Twelve Abstract Concepts by the Experimental Group After Treatment

	Mean Factor	Concepts											
Concepts	Score	1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	2.26												
2. American Public Schools	3.09	.33^c											
3. Cadet Teaching	2.69	.43^c	.40^c										
4. Education	2.87	.61^c	.22^c	.18^b									
5. Historical Information	3.86	1.60^c	.77^c	1.17^c	.99^c								
6. Learning	2.93	.67^c	.16	.24^c	.06	.93^c							
7. Philosophical Beliefs	3.05	.79^c	.04	.36^c	.18^b	.83^c	.12^a						
8. Classroom Observations	3.50	1.24^c	.41^c	.81^c	.63^c	.36^c	.57^c	.45^c					
9. Ethics	3.59	1.33^c	.50^c	.90^c	.72^c	.25^c	.66^c	.54^c	.09				
10. Education Courses	3.83	1.57^c	.74^c	1.14^c	.96^c	.03	.90^c	.78^c	.33^c	.24^b			
11. Class Decisions	3.21	.95^c	.12^a	.52^c	.34^c	.65^c	.28^c	.16^a	.29^c	.38^c	.62^c		
12. Psychology	2.87	.61^c	.22^a	.18^b	.00	.99^c	.06	.18^b	.63^c	.72^c	.96^c	.34^c	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.21

Differences, $d_{(1)(1)}$, of Mean COGNITIVE Factor Scores of Twelve Abstract Concepts by the Experimental Group After Treatment

Concepts	Mean Factor Score	Concepts 1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching	3.43												
2. American Public Schools	3.15	$.28^{b}$											
3. Cadet Teaching	3.41	.02	$.26^{b}$										
4. Education	3.18	$.25^{b}$	.03	$.23^{c}$									
5. Historical Information	2.94	$.49^{c}$	$.21^{a}$	$.47^{c}$	$.24^{b}$								
6. Learning	3.24	$.19^{a}$	.09	$.17^{a}$	.06	$.30^{b}$							
7. Philosophical Beliefs	3.76	$.33^{b}$	$.61^{c}$	$.35^{b}$	$.58^{c}$	$.82^{c}$	$.52^{c}$						
8. Classroom Observations	3.49	.06	$.34^{c}$	.08	$.31^{c}$	$.55^{c}$	$.25^{b}$	$.27^{b}$					
9. Ethics	3.83	$.40^{c}$	$.68^{c}$	$.42^{c}$	$.65^{c}$	$.89^{c}$	$.59^{c}$	.07	$.34^{c}$				
10. Education Courses	3.18	$.25^{a}$	.03	$.23^{b}$	.00	$.24^{b}$	.06	$.58^{c}$	$.31^{c}$	$.65^{c}$			
11. Class Decisions	3.62	.19	$.47^{c}$	$.21^{a}$	$.44^{c}$	$.68^{c}$	$.38^{c}$	.14	.13	$.21^{a}$	$.44^{c}$		
12. Psychology	3.44	.01	$.29^{b}$	.03	$.26^{b}$	$.50^{c}$	.20	$.32^{b}$	.05	$.39^{b}$	$.26^{b}$	.18	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.22

Semantic Distances, $D_{(i)(l)}$, Between Twelve Abstract Concepts

as Determined by the Experimental Group After Treatment

	Concepts *											
Concepts	1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching												
2. American Public Schools	1.11											
3. Cadet Teaching	.44	.75										
4. Education	.75	.43	.37									
5. Historical Information	.19	.88	1.46	1.19								
6. Learning	.74	.51	.32	.14	.75							
7. Philosophical Beliefs	1.59	.94	1.33	1.17	1.49	1.23						
8. Classroom Observations	1.57	.60	1.18	.94	.83	.97	.69					
9. Ethics	1.64	.87	1.26	1.13	.98	1.12	.83	.40				
10. Education Courses	2.27	1.22	1.92	1.65	.88	1.70	1.27	.89	1.03			
11. Class Decisions	1.37	.65	1.12	.97	.99	1.01	.72	.47	.49	.94		
12. Psychology	1.11	.50	.84	.63	1.30	.72	.55	.67	.90	1.38	.68	

* All concepts significantly different at .001 level except learning and education which were significantly different at the .05 level in Factor I.

Table 4.23

Differences, $d_{i(1)}$, of Mean EVALUATIVE Factor Scores of Twelve Abstract Concepts by the Experimental Group Before and After Treatment

		Concepts											
Concepts	Mean Factor Scores	1	2	3	4	5	6	7	8	9	10	11	12
							time 2						
		1.54	2.01	1.58	1.68	2.30	1.61	2.17	2.15	2.21	2.91	2.44	1.95
	time 1												
1. Teaching	1.54		$.47^c$	.04	$.14^c$	$.76^c$	.07	$.63^c$	$.61^c$	$.77^c$	1.37^c	$.90^c$	$.41^c$
2. American Public Schools	2.19	$.65^c$		$.61^c$	$.51^c$	$.11^a$	$.58^c$	.02	.04	.02	$.72^c$	$.25^c$	$.24^c$
3. Cadet Teaching	1.58	.04	$.43^c$		$.10^a$	$.72^c$	.03	$.59^c$	$.57^c$	$.63^c$	1.33^c	$.86^c$	$.37^c$
4. Education	1.63	.09	$.38^c$	.05		$.67^c$	.02	$.54^c$	$.52^c$	$.58^c$	1.28^c	$.81^c$	$.32^c$
5. Historical Information	2.27	$.73^c$	$.26^c$	$.69^c$	$.59^c$		$.66^c$	.10	.12	.06	$.64^c$	$.17^b$	$.32^c$
6. Learning	1.56	.02	$.45^c$	.02	$.12^b$	$.74^c$		$.61^c$	$.59^c$	$.65^c$	1.35^c	$.88^c$	$.39^c$
7. Philosophical Beliefs	2.01	$.47^c$	.00	$.43^c$	$.33^c$	$.29^c$	$.40^c$		$.14^a$	$.20^c$	$.90^c$	$.43^c$	.06
8. Classroom Observations	2.07	$.53^c$	.06	$.49^c$	$.39^c$	$.23^c$	$.46^c$	$.10^a$		$.14^c$	$.84^c$	$.37^c$	$.12^a$
9. Ethics	2.13	$.59^c$	$.12^b$	$.55^c$	$.45^c$	$.17^b$	$.52^c$	.04	.02		$.78^c$	$.31^c$	$.18^c$
10. Education Courses	2.58	1.04^c	$.57^c$	1.00^c	$.90^c$	$.28^a$	$.97^c$	$.41^c$	$.43^c$	$.37^c$		.14	$.63^c$
11. Class Decisions	2.45	$.91^c$	$.44^c$	$.87^c$	$.77^c$	$.15^a$	$.84^c$	$.28^c$	$.30^c$	$.24^c$	$.46^c$		$.50^c$
12. Psychology	1.83	$.29^c$	$.18^b$	$.25^c$	$.15^c$	$.47^c$	$.22^c$	$.34^c$	$.32^c$	$.38^c$	1.08^c	$.61^c$	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.24

Differences, $d_{i(1)}$, of Mean POTENCY Factor Scores of Twelve Abstract Concepts by the Experimental Group Before and After Treatment

		Concepts											
Concepts	Mean Factor Scores	1	2	3	4	5	6	7	8	9	10	11	12
		time 2											
		2.66	3.15	2.76	2.98	2.92	2.89	3.84	3.40	3.22	3.51	3.21	3.49
	time 1												
1. Teaching	2.64		.51^c	.12	.34^c	.28^c	.25^c	1.20^c	.76^c	.58^c	.87^c	.57^c	.85^c
2. American Public Schools	3.32	.66^c		.56^c	.36^c	.40^c	.43^c	.52^c	.08	.10	.19^a	.11	.17
3. Cadet Teaching	2.81	.15	.34^c		.17^b	.11	.08	1.03^c	.59^c	.41^c	.70^c	.40^c	.68^c
4. Education	2.79	.13	.36^c	.03		.19	.10	1.05^c	.61^c	.43^c	.72^c	.42^c	.70^c
5. Historical Information	2.74	.08	.41^c	.02	.24^b		.15^a	1.10^c	.66^c	.48^c	.77^c	.47^c	.75^c
6. Learning	2.80	.14^a	.35^c	.04	.18^b	.12		1.04^c	.60^c	.42^c	.71^c	.41^c	.69^c
7. Philosophical Beliefs	3.87	1.21^c	.72^c	1.11^c	.89^c	.95^c	.98^c		.47^c	.65^c	.36^c	.66^c	.38^c
8. Classroom Observations	3.05	.39^c	.10	.29^c	.07	.13	.16^b	.79^c		.17^a	.46^c	.16^a	.44^c
9. Ethics	3.31	.65^c	.16	.55^c	.33^c	.39^c	.42^c	.53^c	.09		.20^a	.10	.18^a
10. Education Courses	3.10	.44^c	.05	.34^c	.12	.18	.21^a	.74^c	.30^c	.12		.11^a	.39^c
11. Class Decisions	3.22	.56^c	.07	.46^c	.24^b	.30^c	.33^c	.62^c	.18^a	.00	.29^b		.27^b
12. Psychology	3.47	.81^c	.32^c	.71^c	.49^c	.55^c	.58^c	.37^c	.07	.25^a	.04	.26^b	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.25

Differences, $d_{i(1)}$, of Mean ACTIVITY Factor Scores of Twelve Abstract

Concepts by the Experimental Group Before and After Treatment

		Concepts											
		1	2	3	4	5	6	7	8	9	10	11	12
	Mean Factor Scores time 1	time 2											
Concepts		2.26	3.09	2.69	2.87	3.86	2.93	3.05	3.50	3.59	3.83	3.21	2.87
1. Teaching	2.32		.77^c	.37^c	.55^c	1.54^c	.61^c	.73^c	1.18^c	1.27^c	1.51^c	.89^c	.55^c
2. American Public Schools	3.34	1.08^c		.65^c	.47^c	.52^c	.41^c	.29^b	.16^a	.25^c	.49^c	.13	.47^c
3. Cadet Teaching	2.74	.48^c	.35^c		.13	1.12^c	.19^b	.31^c	.76^c	.85^c	1.09^c	.47^c	.13^a
4. Education	2.83	.57^c	.26^c	.14		1.03^c	.10^a	.22^c	.67^c	.76^c	1.00^c	.38^c	.04
5. Historical Information	3.95	1.69^c	.86^c	1.26^c	1.08^c		1.02^c	.90^c	.45^c	.36^c	.12^a	.74^c	1.08^c
6. Learning	3.01	.75^c	.08	.32^c	.14^b	.85^c		.04	.49^c	.58^c	.82^c	.20^b	.14
7. Philosophical Beliefs	2.91	.65^c	.18	.22^b	.04	.95^c	.02		.59^c	.68^c	.92^c	.30^c	.04
8. Classroom Observations	3.55	1.29^c	.46^c	.86^c	.68^c	.31^c	.62^c	.50^c		.04	.28^c	.34^c	.68^c
9. Ethics	3.55	1.29^c	.46^c	.86^c	.68^c	.31^c	.62^c	.50^c	.05		.28^a	.34^c	.68^c
10. Education Courses	3.66	1.40^c	.57^c	.97^c	.79^c	.20^b	.73^c	.61^c	.16^a	.07		.45^c	.79^c
11. Class Decisions	3.21	.95^c	.12^a	.52^c	.34^c	.65^c	.28^c	.16^a	.29^c	.38^c	.62^c		.34^c
12. Psychology	2.86	.60^c	.23^a	.17^b	.01	1.00^c	.07	.19^b	.64^c	.73^c	.97^c	.35^c	

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

Table 4.26

Differences, $d_{i(1)}$, of Mean COGNITIVE Factor Scores of Twelve Abstract Concepts by the Experimental Group Before and After Treatment

		Concepts											
Concepts	Mean Factor Scores	1	2	3	4	5	6	7	8	9	10	11	12
		time 2											
		3.43	3.15	3.41	3.18	2.94	3.24	3.76	3.49	3.83	3.18	3.62	3.44
	time 1												
1. Teaching	3.24		.09	.17	.06	$.30^b$	.00	$.52^c$	$.25^a$	$.59^c$	.06	$.38^c$	.20
2. American Public Schools	3.13	$.30^b$		$.28^b$	.05	.19	.09	$.63^c$	$.36^c$	$.70^c$	.05	$.49^c$	$.31^b$
3. Cadet Teaching	3.42	.01	$.27^a$		$.24^a$	$.48^c$	$.18^a$	$.34^b$	.07	$.41^b$	$.24^a$	$.20^a$	.02
4. Education	3.09	$.34^c$	.06	$.32^c$		.15	.15	$.67^c$	$.40^c$	$.74^c$	.09	$.53^c$	$.35^b$
5. Historical Information	2.99	$.44^c$	.16	$.42^c$	$.19^a$		$.25^b$	$.77^c$	$.50^c$	$.84^c$	$.19^a$	$.63^c$	$.45^c$
6. Learning	3.21	$.22^b$	.06	.20	.03	$.27^b$		$.55^c$	$.28^a$	$.62^c$	.03	$.41^c$	$.23^a$
7. Philosophical Beliefs	3.93	$.50^c$	$.78^c$	$.52^c$	$.75^c$	$.99^c$	$.69^c$		$.44^c$	.10	$.75^c$	$.31^b$	$.49^c$
8. Classroom Observations	3.48	.05	$.33^c$	.07	$.30^c$	$.54^c$	$.24^b$	$.28^a$		$.35^b$	$.30^c$	.14	.04
9. Ethics	3.98	$.55^c$	$.83^c$	$.57^c$	$.80^c$	1.04^c	$.74^c$	$.22^a$	$.49^c$		$.80^c$	$.36^b$	$.54^c$
10. Education Courses	3.04	$.39^c$	.11	$.37^c$	.14	.10	$.20^a$	$.72^c$	$.45^c$	$.79^c$		$.58^c$	$.40^c$
11. Class Decisions	3.58	.15	$.43^c$	.17	$.40^c$	$.64^c$	$.34^c$	.18	.09	.25	$.40^c$		.16
12. Psychology	3.39	.04	$.24^a$	.02	$.21^a$	$.45^c$	.15	$.37^b$	.10	$.44^c$	$.21^a$	$.23^a$	

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 4.27

Semantic Distances, $D_{i(1)}$, Between Twelve Abstract Concepts as Determined by the Experimental Group Before and After Treatment

Concepts	Concepts *											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Teaching												
2. American Public Schools	.33											
3. Cadet Teaching	.05	.28										
4. Education	.20	.13	.15									
5. Historical Information	.19	.14	.14	.01								
6. Learning	.11	.22	.06	.09	.08							
7. Philosophical Beliefs	.26	.07	.21	.06	.07	.15						
8. Classroom Observations	.34	.01	.29	.14	.15	.23	.08					
9. Ethics	.18	.15	.13	.02	.01	.07	.08	.16				
10. Education Courses	.55	.22	.50	.35	.36	.44	.29	.21	.37			
11. Class Decisions	.03	.30	.02	.17	.16	.08	.23	.31	.15	.52		
12. Psychology	.11	.22	.06	.09	.08	.00	.15	.23	.07	.44	.08	

* All concepts significantly different at .001 level except for the following: cadet teaching at t1 and education at t2, .01 level in Factor II; cadet teaching at t1 and learning at t2, .01 level in Factor III; education at t1 and learning at t2, .05 level in Factor III; learning at t1 and education at t2, .01 level in Factor I and Factor III; education courses at t1 and historical information at t2, .01 level in Factor III.

philosophical beliefs, ethics, education courses, and psychology. Since the changes from t1 to t2 are discussed in Chapter 5, the discussion of differences in the abstract concepts will be limited to t1.

Group One Concepts

The rankings of the Group One concepts within the EVALUATIVE factor were:

Teaching
Learning
Cadet Teaching
Education
American Public Schools

It will be noted in Figure 4.2 that the first four concepts in Group One were not significantly different, but all were rated "better" on the "good-bad" scales than American public schools.

The rankings of the Group One concepts within the POTENCY dimension were:

Teaching
Education
Learning
Cadet Teaching
American Public Schools

Here again, the first four concepts were grouped closely together. Teaching was rated slightly more potent than the next three concepts, but all four were rated more potent than American public schools.

The rankings of the Group One concepts within the ACTIVITY dimension were:

Teaching
Cadet Teaching
Education
Learning
American Public Schools

Figure 4.2 indicates that teaching was rated more active than cadet teaching and education, that cadet teaching and education were slightly more active than learning, and that all of the first four factors were rated more active than American public schools.

The rankings of the Group One concepts within the COGNITIVE dimension were:

Education
American Public Schools
Learning
Teaching
Cadet Teaching

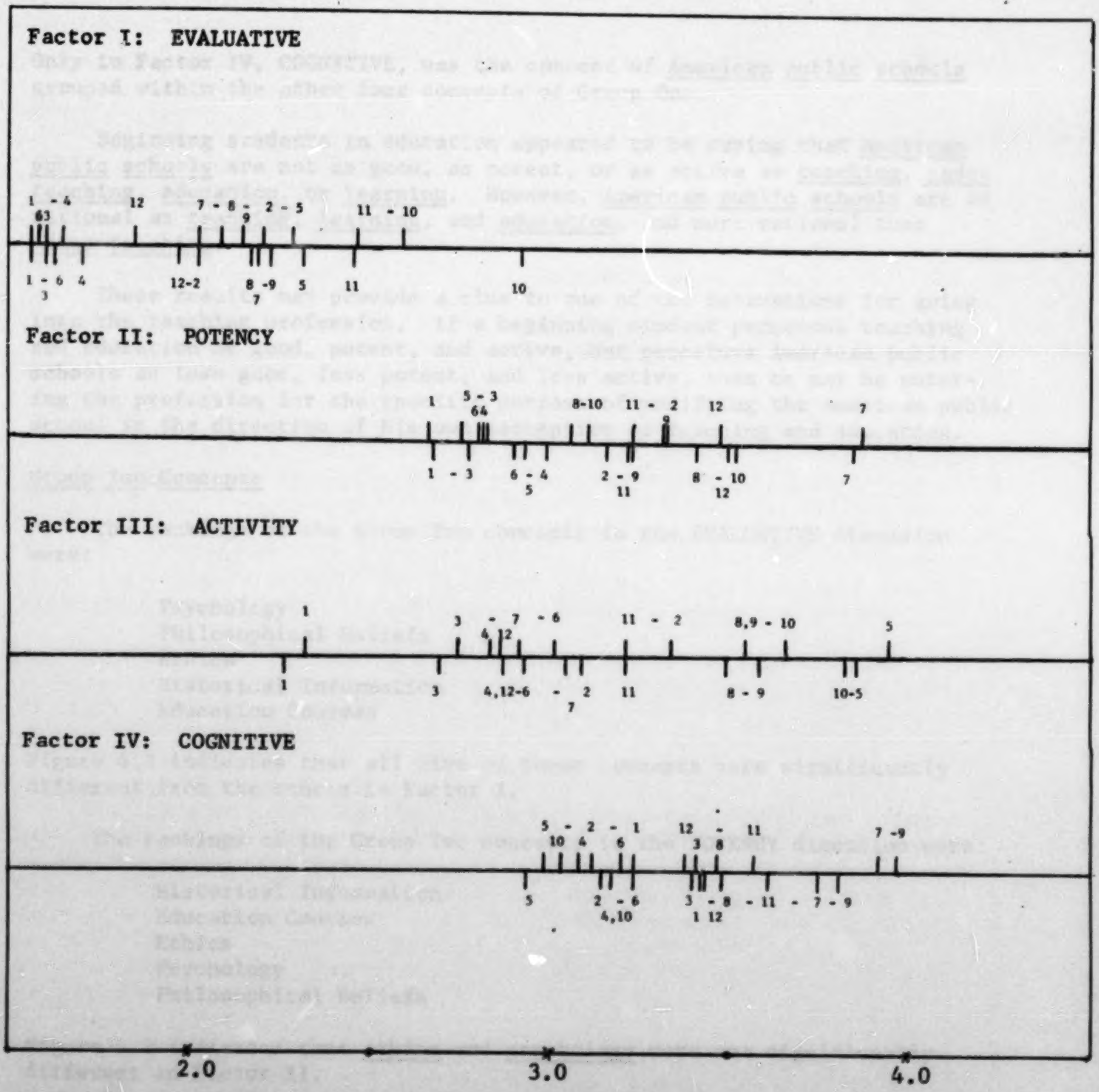

Figure 4.2. Differences of mean factor scores of twelve abstract concepts by the Experimental Group before and after treatment.

Key:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Classroom Decisions
12 = Psychology

Note: Scores above the line were determined before treatment, below the line were determined after treatment. A line between scores indicates no significant differences on that factor.

Only in Factor IV, COGNITIVE, was the concept of American public schools grouped within the other four concepts of Group One.

Beginning students in education appeared to be saying that American public schools are not as good, as potent, or as active as teaching, cadet teaching, education, or learning. However, American public schools are as rational as teaching, learning, and education, and more rational than cadet teaching.

These results may provide a clue to one of the motivations for going into the teaching profession. If a beginning student perceives teaching and education as good, potent, and active, but perceives American public schools as less good, less potent, and less active, then he may be entering the profession for the specific purpose of modifying the American public school in the direction of his own perception of teaching and education.

Group Two Concepts

The rankings of the Group Two concepts in the EVALUATIVE dimension were:

Psychology
Philosophical Beliefs
Ethics
Historical Information
Education Courses

Figure 4.2 indicates that all five of these concepts were significantly different from the others in Factor I.

The rankings of the Group Two concepts in the POTENCY dimension were:

Historical Information
Education Courses
Ethics
Psychology
Philosophical Beliefs

Figure 4.2 indicates that ethics and psychology were not significantly different in Factor II.

The rankings of the Group Two concepts in the ACTIVITY dimension were:

Psychology
Philosophical Beliefs
Ethics
Education Courses
Historical Information

Figure 4.2 indicates that in Factor III psychology and philosophical beliefs were not significantly different, and ethics and education courses were not significantly different.

The rankings of the Group Two concepts in the COGNITIVE dimension were:

Historical Information
Education Courses
Psychology
Philosophical Beliefs
Ethics

Figure 4.2 indicates that in Factor IV historical information and education courses were not significantly different, and philosophical beliefs and ethics were not significantly different.

It is interesting to note that psychology and philosophical beliefs were rated as better (Factor I) and more active (Factor III) than historical information and education courses, but that historical information and education courses were considered to be more potent (Factor II) and more rational (Factor IV) than psychology and philosophical beliefs. Likewise, it is interesting to note that all four of the Group One concepts that rated better in the EVALUATIVE dimension than education courses actually are component parts or are foundational aspects of education courses.

Causes of the results of this analysis were not determined, but the results were interesting enough that additional investigations into causal relations would be warranted.

Summary

This chapter described the differences in meaning among the 12 abstract and 8 human concepts before and after an initial course in education. Three null hypotheses were established to determine whether there were significant differences between the concepts at t1, at t2, and between any given concept at t1 and all other comparable concepts at t2. Because the semantic space consisted of different dimensions for the abstract and the human concepts, each of the three hypotheses was tested separately for the abstract and the human concepts.

All null hypotheses were rejected, indicating that the Ss of the study did perceive the comparable abstract and human concepts as significantly different at t1 and t2. The data indicated within which dimensions the students perceived differences.

Comparison of the human concepts indicated that at t1, the Ss' self-concept, myself, was not significantly different from teacher in the EVALUATIVE and RESPONSIVENESS dimensions, but teacher was rated more potent than myself in the POTENCY dimension. This was interpreted to mean that the Ss perceived themselves as being as good and as responsive as teachers, but without the strength of teachers in the sense of being able to influence or have control over others. Another interesting result was that no difference existed between myself and education instructor and myself and society in the POTENCY dimension.

Comparison of the abstract concepts indicated that two groups of abstract concepts existed. Analysis of the results of the rankings in one of these groups indicated that beginning students in education appeared to be saying that American public schools are not as good, as potent, or as active as teaching, cadet teaching, education, or learning. However, American public schools are as rational as teaching, learning, and education, and more rational than cadet teaching. These results may provide a clue to one of the motivations for going into the teaching profession.

In the second group of abstract concepts, psychology and philosophical beliefs were rated as being better and more active than historical information and education courses, but historical information and education courses were considered to be more potent and more rational than psychology and philosophical beliefs. Likewise, it is interesting to note that all four of the Group One concepts that rated better than education courses in the EVALUATIVE dimension actually are component parts or are foundational aspects of education courses.

Additional investigation to determine causal factors for these differences seems to be warranted.

CHAPTER V

CHANGES IN MEANING OF THE CONCEPTS STUDIED

The preceding chapter presented information regarding the meanings of a class of abstract and human concepts before and after an introductory course in education. This information is beneficial for noting precisely the dimension within which differences exist between concepts, and the technique can be used with individuals or with groups. However, if instructional methods and content are to be effective in modifying the students' conceptual structures (and one could hardly assume that the purposes of instruction are otherwise), it will be necessary to know whether the treatment changes the meanings of concepts.

This chapter describes a procedure used for determining whether the meanings of twelve abstract and eight human concepts changed as a result of an initial course in education and analyzes the changes that occurred. The information is distinctive in that it provides a measure of changes in meaning (one dimension of which is attitude) during a period of instruction rather than during therapy or following a single communication. The nature of the information is significantly different from that obtained from more traditional tests and is related to both the cognitive and affective domains.

Design for Testing for Change

The hypothesis tested in this part of the study was stated in null form:

> H1. For beginning students in education, there is no significant change in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential during a one-quarter course in education.

For testing this hypothesis, a before-after, one-control design was used in which the semantic differential was administered to students in all sections of an introductory course in education. The course was required for teacher certification and sections usually included mainly sophomores and juniors. Students in lower division speech and English courses were used as the control group to check the assumption that no contemporaneous events affected the meanings of the concepts. Under the existing institutional conditions, random assignment to experimental and control groups was not possible.

In order to determine the factor scores for each student on each concept, a procedure was developed which identified a set of factors that were common to the concepts being compared. Separate factors were determined for the abstract and the human concepts using the procedure described in detail in Chapter III. The data indicated that the human concepts had three factors consistent enough for comparison across concepts (EVALUATIVE, RESPONSIVENESS, POTENCY); the abstract concepts had four factors consistent enough for comparison across all concepts (EVALUATIVE, POTENCY, ACTIVITY, COGNITIVE).

Data for the Human Concepts

As described in Chapter IV, factor scores were computed for each individual on each concept and occasion by summing his scores on the scales involved in the factor and dividing by the number of scales in the factor. The meaning of a concept for any individual was determined by the location of a point in the k-dimensional semantic space, and a "cloud" of points represented the meaning of a concept for an entire group. The question involved in Hypothesis 1 was whether the "cloud" of points shifted significantly during treatment and if so, in which dimension it changed.

The following diagram indicates where measures were taken and comparisons made.

	time 1	treatment	time 2
experimental group (x)	xt1	tr	xt2
control group (c)	ct1		ct2

The following measures were of concern in determining whether changes in meanings of the concepts occurred during the experiment and whether the changes were due to the treatment.

(a) experimental group gain xd = xt2 - xt1

(b) control group gain cd = ct2 - ct1

(c) comparison of x and c groups at beginning of experiment = xt1 - ct1

(d) comparison of gain scores of x and c groups = xd - cd

To test xd and cd, a Wilcoxon matched-pair signed rank test was completed on each factor for each concept, and the results of the analysis are seen in Table 5.1 and Table 5.2.

To determine the similarity of the x and c groups at time 1 (since they were not randomly assigned), the distribution of the scores of the two groups at time 1 was compared by means of the Mann Whitney U test. The results of this analysis are seen in Table 5.3.

To determine whether the experimental group gained more than the control group, individual gain scores were computed and the distributions of these gain scores were compared. The Mann Whitney U test was used for determining the significance levels. The results of these analyses are seen in Table 5.4.

Figure 5.1 shows the location of the mean factor scores of the eight human concepts on a section of the seven point scale for all three factors in the experimental and control groups. The top two lines show the factor scores for the EVALUATIVE dimension, the middle two lines the RESPONSIVENESS factor, and the lower two lines the POTENCY dimension. The scores above the

Table 5.1

Gain in Mean Factor Scores of the Experimental Group

on Eight Human Concepts

Concepts	$\overline{x}$FI	$\overline{x}$F(I)	$\overline{x}$dI	$\overline{x}$FII	$\overline{x}$F(II)	$\overline{x}$dII	$\overline{x}$FIII	$\overline{x}$F(III)	$\overline{x}$dIII	$\overline{x}$D
1. Pupils	2.34	2.18	$.16^{c}$	3.03	2.88	$.15^{b}$	3.67	3.45	$.22^{c}$	.32
2. Parents	2.54	2.58	-.04	2.56	2.72	$-.16^{b}$	3.29	3.23	.06	.17
3. Teacher	2.15	2.15	.00	2.35	2.35	.00	2.71	2.75	-.04	.12
4. Administrators	2.95	2.70	$.25^{c}$	2.74	2.61	$.13^{b}$	2.86	2.73	$.13^{a}$	.25
5. Human Beings	2.43	2.37	.06	3.30	3.11	$.19^{b}$	3.40	3.29	.11	.21
6. Education Instructors	2.65	2.69	-.04	2.64	2.63	.01	2.96	3.09	$-.13^{a}$	.13
7. Myself	2.16	2.10	$.06^{a}$	2.38	2.38	.00	3.04	2.98	.06	.25
8. Society	2.95	2.84	$.11^{a}$	3.56	3.41	$.15^{b}$	3.14	3.12	.02	.19

Note: $\overline{x}$FI - Mean Factor I score for the experimental group at time 1.
$\overline{x}$F(I) - Mean Factor I score for the experimental group at time 2.
$\overline{x}$dI - Gain in mean scores between time 1 and time 2 on Factor I for the experimental group.
$\overline{x}$D - The distance between a concept at time 1 and the same concept at time 2 for the experimental group.
Factors II and III have symbols with similar meanings.

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 5.2

Gain in Mean Factor Scores of the Control Group

on Eight Human Concepts

Concepts	$\overline{\text{cFI}}$	$\overline{\text{cF}}\text{(I)}$	$\overline{\text{cdI}}$	$\overline{\text{cFII}}$	$\overline{\text{cF}}\text{(II)}$	$\overline{\text{cdII}}$	$\overline{\text{cFIII}}$	$\overline{\text{cF}}\text{(III)}$	$\overline{\text{cdIII}}$	$\overline{\text{cD}}$
1. Pupils	2.49	2.59	-.10	3.01	3.07	-.06	3.40	3.35	.05	.12
2. Parents	2.51	2.57	-.06	2.37	2.48	-.11	3.02	3.11	-.09	.15
3. Teacher	2.45	2.83	$-.38^{c}$	2.55	2.82	$-.27^{b}$	2.76	2.97	-.21	.16
4. Administrators	3.18	3.41	$-.23^{a}$	2.92	3.10	-.17	2.91	2.96	-.05	.29
5. Human Beings	2.61	2.77	-.16	3.48	3.41	.07	3.54	3.61	-.07	.19
6. Education Instructors	2.91	3.07	-.16	2.79	2.93	-.14	3.16	3.17	-.01	.21
7. Myself	2.27	2.37	-.10	2.34	2.54	$-.20^{a}$	3.01	3.10	-.09	.24
8. Society	3.20	3.20	.00	3.66	3.73	-.07	3.12	3.22	-.10	.12

Note: $\overline{\text{cFI}}$ - Mean Factor I score for the control group at time 1.
$\overline{\text{cF}}\text{(I)}$ - Mean Factor I score for the control group at time 2.
$\overline{\text{cdI}}$ - Gain in mean scores between time 1 and time 2 on Factor I for the control group.
$\overline{\text{cD}}$ - The distance between a concept at time 1 and the same concept at time 2 for the control group.
Factors II and III have symbols with similar meanings.

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 5.3

Difference Between Mean Factor Scores of the Experimental and Control Groups Before Treatment on Eight Human Concepts

Concepts	$\overline{xFI}$	$\overline{cFI}$	dI	$\overline{xFII}$	$\overline{cFII}$	dII	$\overline{xFIII}$	$\overline{cFIII}$	dIII
1. Pupils	2.34	2.49	.15[a]	3.03	3.01	.02	3.67	3.40	.27[b]
2. Parents	2.54	2.51	.03	2.56	2.37	.19	3.29	3.02	.27[a]
3. Teacher	2.15	2.45	.30[b]	2.35	2.55	.20	2.71	2.76	.05
4. Administrators	2.95	3.18	.23	2.74	2.92	.18	2.86	2.91	.05
5. Human Beings	2.43	2.61	.17[a]	3.30	3.48	.18	3.40	3.54	.14
6. Education Instructors	2.65	2.91	.26[a]	2.64	2.79	.15	2.96	3.16	.20
7. Myself	2.16	2.27	.11	2.38	2.34	.04	3.04	3.01	.03
8. Society	2.95	3.20	.25[a]	3.56	3.66	.10	3.14	3.12	.02

Note: $\overline{xFI}$ - Mean Factor I score for the experimental group at time 1.
$\overline{cFI}$ - Mean Factor I score for the control group at time 1.
dI - Difference between mean experimental and mean control scores at time 1 on Factor I.

Factors II and III have symbols with similar meanings.

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 5.4

Differences Between Gain Scores of the Experimental and Control Groups on Eight Human Concepts

Concepts	$\overline{xd}$I	$\overline{cd}$I	dI	$\overline{xd}$II	$\overline{cd}$II	dII	$\overline{xd}$III	$\overline{cd}$III	dIII
1. Pupils	.16^{c}	-.10	.26^{b}	.15^{b}	-.06	.21	.22^{c}	.05	.17
2. Parents	-.04	-.06	-.02	-.16^{b}	-.11	-.05	.06	-.09	-.15
3. Teacher	.00	-.38^{c}	.38^{c}	.00	-.27^{b}	.27^{a}	-.04	-.21	-.17
4. Administrators	.25^{c}	-.23^{a}	.48^{c}	.13^{b}	-.17	-.30^{b}	.13^{a}	-.05	.18
5. Human Beings	.06	-.16	-.22^{a}	.19^{b}	.07	.12	.11	-.07	.18
6. Education Instructors	-.04	-.16	-.12	.01	-.14	-.15	-.13^{a}	-.01	-.12
7. Myself	.06^{a}	-.10	-.16	.00	-.20^{a}	.20	.06	-.09	-.15
8. Society	.11	.00	.11	.15^{b}	-.07	.22^{a}	.02	-.10	-.12

Note: $\overline{xd}$I - Gain in mean scores between time 1 and time 2 on Factor I for the experimental group.
cdI - Gain in mean scores between time 1 and time 2 on Factor I for the control group.
dI - Difference between gain scores of the experimental and control groups.

Factors II and III have symbols with similar meanings.

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

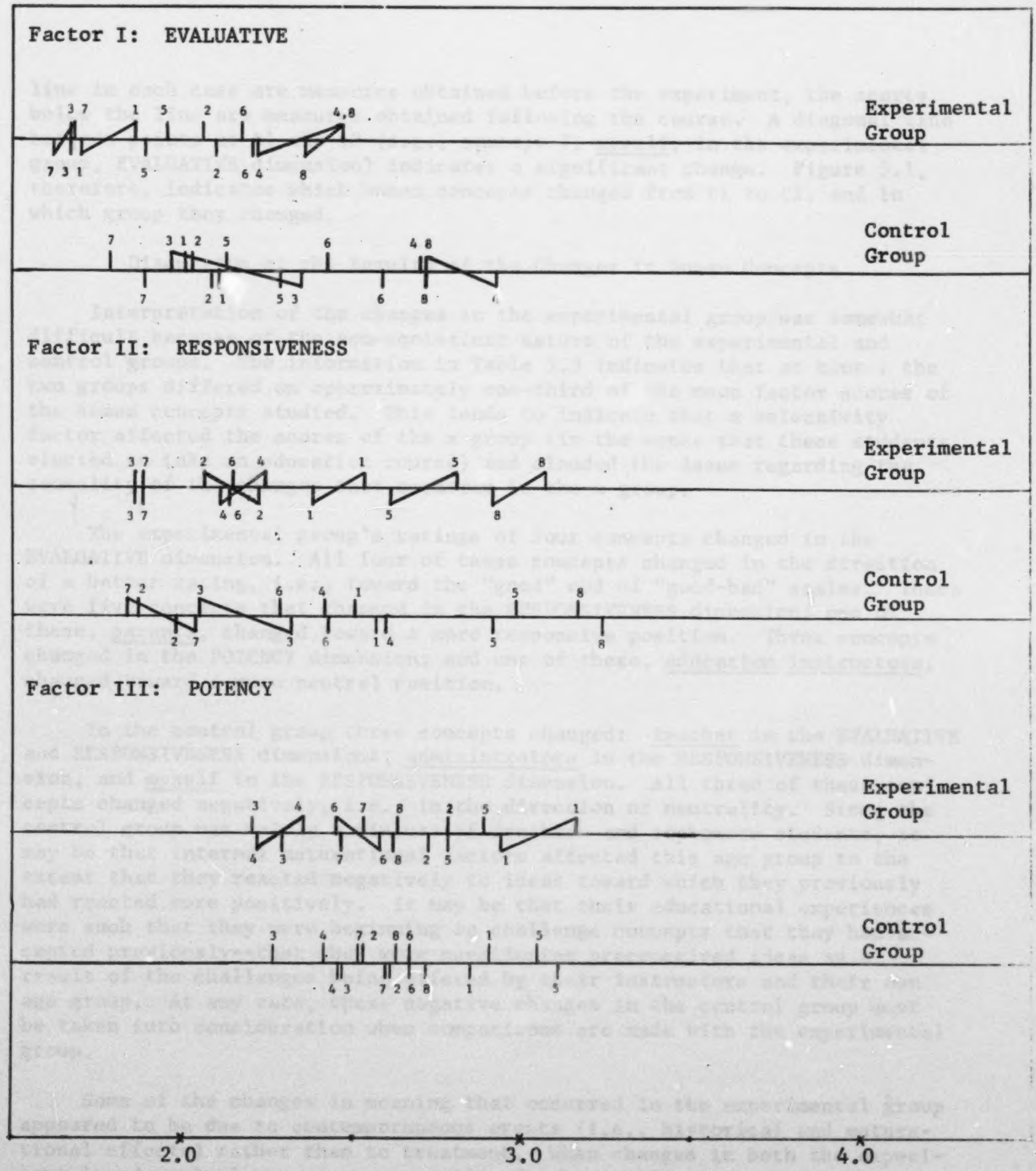

Figure 5.1. Changes in mean factor scores of eight human concepts by the Experimental and Control Groups before and after treatment.

Key:

1 = Pupils	5 = Human Beings
2 = Parents	6 = Education Instructors
3 = Teacher	7 = Myself
4 = Administrators	8 = Society

Note: Scores above the line were determined before the treatment, below the line after the treatment. A connecting diagonal line between a score before treatment and a score after treatment indicates a change in the mean factor score.

line in each case are measures obtained before the experiment, the scores below the line are measures obtained following the course. A diagonal line between points at t1 and t2 (e.g., concept 7, myself, in the experimental group, EVALUATIVE dimension) indicates a significant change. Figure 5.1, therefore, indicates which human concepts changed from t1 to t2, and in which group they changed.

Discussion of the Results of the Changes in Human Concepts

Interpretation of the changes in the experimental group was somewhat difficult because of the non-equivalent nature of the experimental and control groups. The information in Table 5.3 indicates that at time 1 the two groups differed on approximately one-third of the mean factor scores of the human concepts studied. This tends to indicate that a selectivity factor affected the scores of the x group (in the sense that these students elected to take an education course) and clouded the issue regarding the causality of the changes that occurred in the x group.

The experimental group's ratings of four concepts changed in the EVALUATIVE dimension. All four of these concepts changed in the direction of a better rating, i.e., toward the "good" end of "good-bad" scales. There were five concepts that changed in the RESPONSIVENESS dimension; one of these, parents, changed toward a more responsive position. Three concepts changed in the POTENCY dimension; and one of these, education instructors, changed toward a more neutral position.

In the control group three concepts changed: teacher in the EVALUATIVE and RESPONSIVENESS dimensions, administrators in the RESPONSIVENESS dimension, and myself in the RESPONSIVENESS dimension. All three of these concepts changed negatively, i.e., in the direction of neutrality. Since the control group was mainly a mixture of freshman and sophomore students, it may be that internal maturational factors affected this age group to the extent that they reacted negatively to ideas toward which they previously had reacted more positively. It may be that their educational experiences were such that they were beginning to challenge concepts that they had accepted previously--that they were questioning preconceived ideas as a result of the challenges being offered by their instructors and their own age group. At any rate, these negative changes in the control group must be taken into consideration when comparisons are made with the experimental group.

Some of the changes in meaning that occurred in the experimental group appeared to be due to contemporaneous events (i.e., historical and maturational effects) rather than to treatment. When changes in both the experimental and control groups were considered, the results were somewhat different from those of the experimental group only. It was noted above that the meaning of four concepts changed in the EVALUATIVE dimension in the experimental group. Only two of the concepts, pupils and administrators, showed more change in the experimental group than in the control group. Likewise, in the RESPONSIVENESS dimension, of the five concepts that changed in the experimental group, only two concepts, administrators and society, showed more change in the experimental group than in the control group. In the POTENCY dimension, none of the three concepts that changed in the experimental group showed more change in the experimental group than in the control group. Therefore, of the changes that occurred in the experimental group, only pupils (in the EVALUATIVE dimension), administrators (in the EVALUATIVE and RESPONSIVENESS dimensions), and society (in the RESPONSIVENESS dimension) can be attributed to the treatment. The change in pupils appears to be a reinforcement of a predisposition, since the x and c groups differed at t1, and selectivity of the x group may have affected these results.

On two other concepts, teacher (in the EVALUATIVE and RESPONSIVENESS dimensions) and human beings (in the EVALUATIVE dimension), there was a significant difference in the amount of change in the experimental and control groups. These changes were due to the negative changes in the control group (in contrast to the small and non-significant changes in the experimental group) rather than to the absolute change in the experimental group. Again, the changes in the EVALUATIVE dimension may have been more related to the selectivity of the x group than to treatment since the x and c groups were significantly different at t1 on this factor and these two concepts. Only in the sense that the treatment might have arrested a historical or maturational effect could the treatment be considered to have caused a change in the meanings of these concepts.

Some of the changes in meaning found in these human concepts might be explained by the observation experience of the course while others appeared to be linked to the social foundations content of the lectures and the reading material. For example, the changes in meaning of pupils and administrators more probably occurred as a result of the observations, due to the type of relationship the Ss had with these individuals during the observation experience. On the other hand, it is more likely that the meanings of society and human beings were modified due to the lectures and reading material.

Data for the Abstract Concepts

The procedure used for the human concepts was followed for the abstract concepts. The results of a Wilcoxon matched-pair signed rank test on each factor for each concept to test for changes in the experimental group from t1 to t2 are seen in Table 5.5. The results of testing for changes in the control group from t1 to t2 are seen in Table 5.6.

The Mann Whitney U test was used to test the comparability of the experimental and control groups on all factors and concepts at t1. The results of these analyses are seen in Table 5.7.

A comparison of the experimental and control difference score distributions was made to determine whether the experimental group changed more than the control group. The Mann Whitney U test was used for determining the significance levels and the results of these analyses are seen in Table 5.8.

Figure 5.2 shows the location of the mean factor scores of the 12 abstract concepts on a section of the seven point scale for all four factors in the experimental and the control groups. The top two lines show the

Table 5.5

Gain in Mean Factor Scores of the Experimental Group

on Twelve Abstract Concepts

Concepts	$\overline{xF}$I	$\overline{xF}$(I)	$\overline{xd}$I	$\overline{xF}$II	$\overline{xF}$(II)	$\overline{xd}$II	$\overline{xF}$III	$\overline{xF}$(III)	$\overline{xd}$III	$\overline{xF}$IV	$\overline{xF}$(IV)	$\overline{xd}$IV	$\overline{xD}$
1. Teaching	1.54	1.54	.00	2.64	2.66	-.02	2.32	2.26	.06	3.24	3.43	-.19^a	.20
2. American Public Schools	2.19	2.01	.18^c	3.32	3.15	.17^b	3.34	3.09	.25^b	3.13	3.15	-.02	.35
3. Cadet Teaching	1.58	1.58	.00	2.81	2.76	.05	2.74	2.69	.05	3.42	3.41	.01	.07
4. Education	1.63	1.68	-.05^a	2.79	2.98	-.19^b	2.83	2.87	-.04	3.09	3.18	-.09	.22
5. Historical Information	2.27	2.30	-.03	2.74	2.92	-.18^b	3.95	3.86	.09	2.99	2.94	.05	.21
6. Learning	1.56	1.61	-.05	2.80	2.89	-.09	3.01	2.93	.08	3.21	3.24	-.03	.13
7. Philosophical Beliefs	2.01	2.17	-.16^b	3.87	3.84	.03	2.91	3.05	-.14^a	3.93	3.76	.19	.29
8. Classroom Observations	2.07	2.15	-.08	3.05	3.40	-.35^c	3.55	3.50	.05	3.48	3.49	-.01	.36
9. Ethics	2.13	2.21	-.08	3.31	3.22	.09	3.55	3.59	-.04	3.98	3.83	.15	.20
10. Education Courses	2.58	2.91	-.33^c	3.10	3.51	-.41^c	3.66	3.83	-.17^b	3.04	3.18	-.14	.57
11. Class Decisions	2.45	2.44	.01	3.22	3.21	.01	3.21	3.21	.00	3.58	3.62	-.04	.04
12. Psychology	1.83	1.95	-.12^b	3.47	3.49	-.02	2.86	2.87	-.01	3.39	3.44	-.05	.13

Note: $\overline{xF}$I - Mean Factor I score for the experimental group at time 1.
$\overline{xF}$(I) - Mean Factor I score for the experimental group at time 2.
$\overline{xd}$I - Gain in mean scores between time 1 and time 2 on Factor I for the experimental group.
xD - The distance between a concept at time 1 and the same concept at time 2 for the experimental group.
Factors II, III, and IV have symbols with similar meanings.

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

Table 5.6

Gain in Mean Factor Scores of the Control Group

on Twelve Abstract Concepts

Concepts	$\overline{\text{cFI}}$	$\overline{\text{cF(I)}}$	$\overline{\text{cdI}}$	$\overline{\text{cFII}}$	$\overline{\text{cF(II)}}$	$\overline{\text{cdII}}$	$\overline{\text{cFIII}}$	$\overline{\text{cF(III)}}$	$\overline{\text{cdIII}}$	$\overline{\text{cFIV}}$	$\overline{\text{cF(IV)}}$	$\overline{\text{cdIV}}$	$\overline{\text{cD}}$
1. Teaching	1.78	1.85	-.07	2.83	2.93	-.10	2.70	2.67	.03	3.51	3.65	-.14	.19
2. American Public Schools	2.36	2.34	.02	3.52	3.52	.00	3.71	3.76	-.05	3.33	3.44	-.11	.12
3. Cadet Teaching	2.02	2.15	-.13	3.16	3.28	-.12	3.15	3.23	.08	3.59	3.48	.11	.22
4. Education	1.59	1.84	$-.25^b$	2.93	3.07	-.14	3.08	3.31	$-.23^a$	3.10	3.40	-.30	.67
5. Historical Information	2.52	2.56	-.04	2.99	3.22	$-.23^a$	4.11	4.37	-.26	2.99	3.00	-.01	.35
6. Learning	1.66	1.68	-.02	3.05	3.16	-.11	3.23	3.23	.00	3.45	3.63	-.18	.21
7. Philosophical Beliefs	2.23	2.13	.10	3.82	4.04	-.22	2.99	2.96	.03	4.07	4.10	-.03	.25
8. Classroom Observations	2.55	2.58	-.03	3.48	3.52	-.04	3.73	3.82	-.09	3.54	3.40	.14	.17
9. Ethics	2.35	2.38	-.03	3.21	3.38	-.17	3.74	3.73	.01	3.73	3.92	-.19	.26
10. Education Courses	2.67	2.90	$-.23^a$	3.19	3.39	$-.20^a$	3.79	3.89	-.10	3.12	3.46	$-.34^a$	.47
11. Class Decisions	2.66	2.55	.11	3.43	3.49	-.06	3.61	3.43	.18	3.71	3.93	-.22	.31
12. Psychology	1.87	2.04	-.17	3.48	3.67	-.19	2.91	2.88	.03	3.71	3.54	.17	.31

Note: $\overline{\text{cFI}}$ - Mean Factor I score for the control group at time 1.
$\overline{\text{cF(I)}}$ - Mean Factor I score for the control group at time 2.
$\overline{\text{cdI}}$ - Gain in mean scores between time 1 and time 2 on Factor I for the control group.
$\overline{\text{cD}}$ - The distance between a concept at time 1 and the same concept at time 2 for the control group.
Factors II, III, and IV have symbols with similar meanings.

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 5.7

Difference Between Mean Factor Scores of the Experimental and Control Groups Before Treatment on Twelve Abstract Concepts

Concepts	$\overline{xFI}$	$\overline{cFI}$	dI	$\overline{xFII}$	$\overline{cFII}$	dII	$\overline{xFIII}$	$\overline{cFIII}$	dIII	$\overline{xFIV}$	$\overline{cFIV}$	dIV
1. Teaching	1.54^c	1.78	.24	2.64	2.83	.19	2.32	2.70	.38	3.24	3.51	.27
2. American Public Schools	2.19	2.36	.17	3.32	3.52	.20	3.34^b	3.71	.37	3.13	3.33	.20
3. Cadet Teaching	1.58^c	2.02	.44	2.81	3.16	.35	2.74^b	3.15	.41	3.42	3.59	.17
4. Education	1.63	1.59	.04	2.79	2.93	.14	2.83^a	3.08	.25	3.09	3.10	.01
5. Historical Information	2.27^a	2.52	.25	2.74	2.99	.25	3.95	4.11	.16	2.99	2.99	.00
6. Learning	1.56	1.66	.10	2.80	3.05	.25	3.01	3.23	.22	3.21	3.45	.24
7. Philosophical Beliefs	2.01^a	2.23	.22	3.87	3.82	.05	2.91	2.99	.08	3.93	4.07	.14
8. Classroom Observations	2.07^c	2.55	.48	3.05^b	3.48	.43	3.55	3.73	.18	3.48	3.54	.06
9. Ethics	2.13	2.35	.22	3.31	3.21	.10	3.55	3.74	.19	3.98	3.73	.25
10. Education Courses	2.58	2.67	.09	3.10	3.19	.09	3.66	3.79	.13	3.04	3.12	.08
11. Class Decisions	2.45	2.66	.21	3.22	3.43	.21	3.21^b	3.61	.40	3.58	3.71	.13
12. Psychology	1.83	1.87	.04	3.47	3.48	.01	2.86	2.91	.05	3.39	3.71	.32

Note: $\overline{xFI}$ - Mean Factor I score for the experimental group at time 1.
cFI - Mean Factor I score for the control group at time 1.
dI - Difference between mean experimental and mean control scores at time 1 on Factor I.
Factors II, III, and IV have symbols with similar meanings.

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 5.8

Differences Between Gain Scores of the Experimental and Control

Groups on Twelve Abstract Concepts

Concepts	$\overline{xd}$I	$\overline{cd}$I	$\underline{d}$I	$\overline{xd}$II	$\overline{cd}$II	$\underline{d}$II	$\overline{xd}$III	$\overline{cd}$III	$\underline{d}$III	$\overline{xd}$IV	$\overline{cd}$IV	$\underline{d}$IV
1. Teaching	.00	-.07	.07	-.02	-.10	-.08	.06	.03	.03	$-.19^a$	-.14	-.05
2. American Public Schools	$.18^c$	.02	$.16^a$	$.17^b$	.00	.17	$.25^b$	-.05	.30	-.02	-.11	-.09
3. Cadet Teaching	.00	-.13	.13	.05	-.12	-.17	.05	.08	.03	.01	.11	.10
4. Education	$-.05^a$	$-.25^b$	-.20	$-.19^b$	-.14	-.05	-.04	$-.23^a$	-.19	-.09	-.30	-.21
5. Historical Information	-.03	-.04	-.01	$-.18^b$	$-.23^a$	-.05	.09	-.26	$-.35^a$	.05	-.01	.06
6. Learning	-.05	-.02	-.03	-.09	-.11	-.02	.08	.00	.08	-.03	-.18	-.15
7. Philosophical Beliefs	$-.16^b$	.10	-.26	.03	-.22	-.25	$-.14^a$	.03	-.17	.19	-.03	.22
8. Classroom Observations	-.08	-.03	-.05	$-.35^c$	-.04	$-.31^a$	.05	-.09	-.14	-.01	.14	.15
9. Ethics	-.08	-.03	-.05	.09	-.17	-.26	-.04	.01	-.05	.15	-.19	-.34
10. Education Courses	$-.33^c$	$-.23^a$	-.10	$-.41^c$	$-.20^a$	-.21	$-.17^b$	-.10	-.07	-.14	$-.34^a$	-.20
11. Class Decisions	.01	.11	.10	.01	-.06	-.07	.00	.18	.18	-.04	-.22	-.18
12. Psychology	$-.12^b$	-.17	-.05	-.02	-.19	-.17	-.01	.03	.04	-.05	.17	-.22

Note: $\overline{xd}$I - Gain in mean scores between time 1 and time 2 on Factor I for the experimental group.
$\overline{cd}$I - Gain in mean scores between time 1 and time 2 on Factor I for the control group.
$\underline{d}$I - Difference between gain scores of the experimental and control groups.
Factors II, III, and IV have symbols with similar meanings.

^{a} .05 level of significance
^{b} .01 level of significance
^{c} .001 level of significance

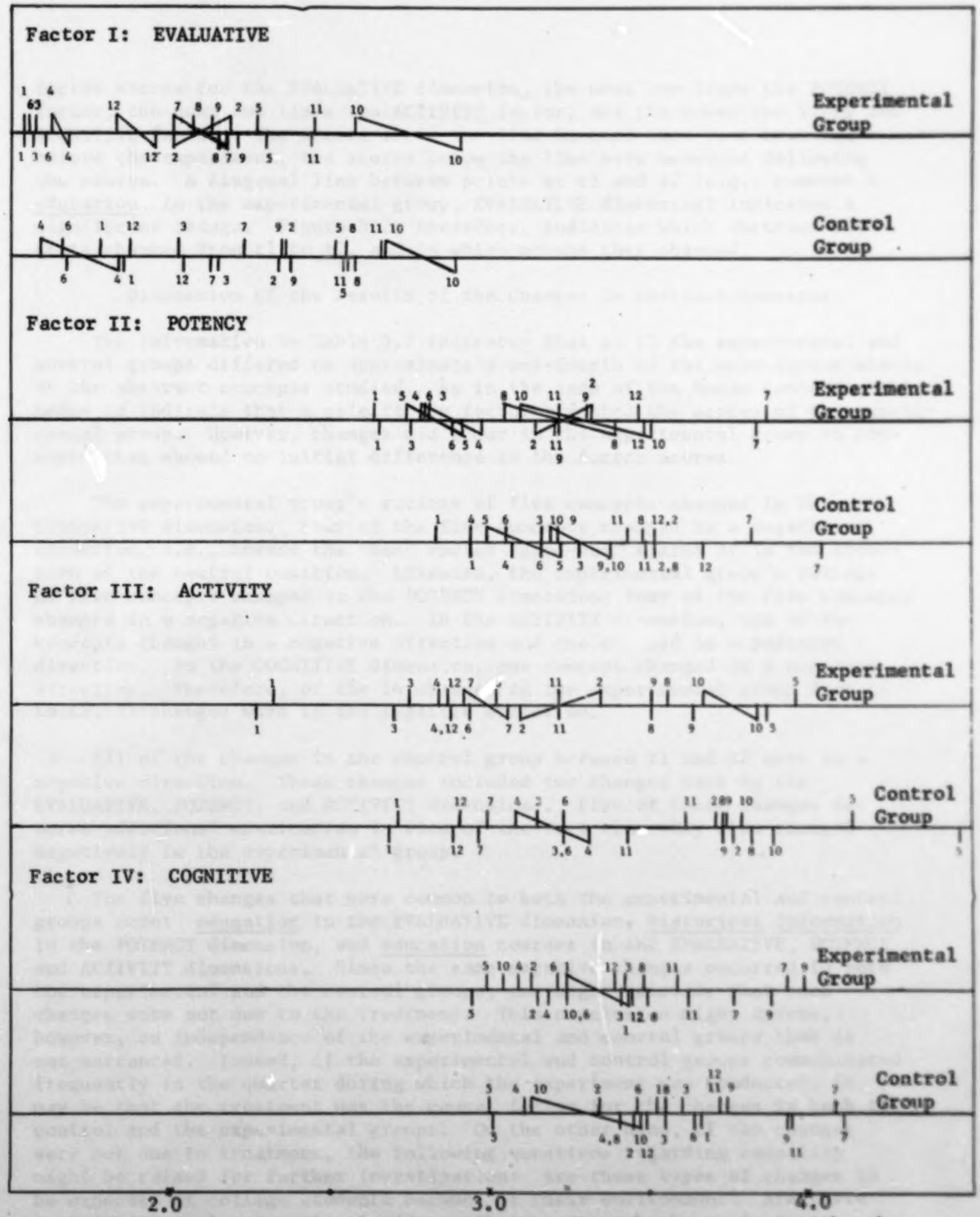

Figure 5.2. Changes in mean factor scores of twelve abstract concepts by the Experimental and Control Groups before and after treatment.

Key:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Classroom Decisions
12 = Psychology

Note: Scores above the line were determined before the treatment, below the line after the treatment. A connecting diagonal line between a score before treatment and a score after treatment indicates a change in the mean factor score.

factor scores for the EVALUATIVE dimension, the next two lines the POTENCY factor, the next two lines the ACTIVITY factor, and the lower two lines the COGNITIVE factor. The scores above the line in each case were measures before the experiment, the scores below the line were measures following the course. A diagonal line between points at t1 and t2 (e.g., concept 4, education, in the experimental group, EVALUATIVE dimension) indicates a significant change. Figure 5.2, therefore, indicates which abstract concepts changed from t1 to t2, and in which groups they changed.

Discussion of the Results of the Changes in Abstract Concepts

The information in Table 5.7 indicates that at t1 the experimental and control groups differed on approximately one-fourth of the mean factor scores of the abstract concepts studied. As in the case of the human concepts, this tends to indicate that a selectivity factor affected the scores of the experimental group. However, changes did occur in the experimental group on concepts that showed no initial difference in the factor scores.

The experimental group's ratings of five concepts changed in the EVALUATIVE dimension. Four of the five concepts changed in a negative direction, i.e., toward the "bad" end of "good-bad" scales or in the direction of the neutral position. Likewise, the experimental group's ratings of five concepts changed in the POTENCY dimension; four of the five concepts changed in a negative direction. In the ACTIVITY dimension, two of the concepts changed in a negative direction and one changed in a positive direction. In the COGNITIVE dimension, one concept changed in a negative direction. Therefore, of the 14 changes in the experimental group from t1 to t2, 11 changes were in the negative direction.

All of the changes in the control group between t1 and t2 were in a negative direction. These changes included two changes each in the EVALUATIVE, POTENCY, and ACTIVITY dimensions. Five of these changes deserve additional examination in view of the fact that they also changed negatively in the experimental group.

The five changes that were common to both the experimental and control groups were: education in the EVALUATIVE dimension, historical information in the POTENCY dimension, and education courses in the EVALUATIVE, POTENCY and ACTIVITY dimensions. Since the same negative changes occurred in both the experimental and the control groups, one might conclude that such changes were not due to the treatment. This conclusion might assume, however, an independence of the experimental and control groups that is not warranted. Indeed, if the experimental and control groups communicated frequently in the quarter during which the experiment was conducted, it may be that the treatment was the causal factor for the changes in both the control and the experimental groups. On the other hand, if the changes were not due to treatment, the following questions regarding causality might be raised for further investigation: Are these types of changes to be expected of college students because of their environment? Are there certain internal maturational effects that cause such changes? Is it possible that the changes are not due to the class of concepts being studied but that they are related either to the general image of education courses or to the views held by professors who do not teach education courses? What is the relationship between the students' views of the concepts studied and their professors' views? The causality of the changes noted here were not attributable to a single factor, but the changes observed certainly indicate that continued research might be fruitful for the purpose of ascertaining causality.

When changes in both the experimental and control groups were considered, i.e., when the xd and cd distributions were compared, only three changes were noted: American public schools in the EVALUATIVE dimension, classroom observations in the POTENCY dimension (a negative change), and historical information in the ACTIVITY dimension. These appeared to be the only changes that might be attributed to the treatment. One of these, the negative change in classroom observations, might be related to the selectivity of the experimental group; at t1, the experimental group was significantly different from the control group on this concept and factor. One of the changes, historical information in the ACTIVITY dimension, appeared to be due to the small non-significant negative change in the control group in combination with the small non-significant positive change in the experimental group rather than to the absolute change in the experimental group. If one considers the treatment arrested a historical or maturational effect, the change in this concept could be attributed to the treatment.

One of the changes in meaning found in these concepts, viz., in classroom observations, more probably occurred as a result of the observations. Another of the changes, historical information, more probably occurred as a result of the lectures and reading assignments. The change noted in American public schools may have been due to the observations or the course content, or an interaction of the two.

Summary

This chapter described a procedure used for determining whether the meanings of twelve abstract and eight human concepts changed as a result of an initial course in education and analyzed the changes that occurred. The question involved in the hypothesis tested was whether the "cloud" of points which represented the meaning of a concept for an entire group shifted significantly during treatment and if so, in which dimension it changed.

A before-after, one-control design was used in which the semantic differential was administered to students in all sections of an introductory course in education. Students in lower division speech and English courses were used as the control group. Under the existing institutional conditions, random assignment to experimental and control groups was not possible; consequently, comparisons were made between the experimental and control groups at t1.

The following measures were analyzed: experimental group change (xd), control group change (cd), and the difference between the xd and cd distributions (xd - cd).

Changes in the human concepts that could be attributed to the treatment included: pupils (in the EVALUATIVE dimension), administrators (in the EVALUATIVE and RESPONSIVENESS dimensions), and human beings (in the EVALUATIVE dimension). The changes in teacher and human beings were due to the negative changes in the control group rather than the absolute change in the experimental group. Changes in pupils and human beings in the EVALUATIVE dimension may have been related to the selectivity of the experimental group rather than to treatment.

Changes in the abstract concepts that could be attributed to the treatment included: American public schools in the EVALUATIVE dimension, classroom observations in the POTENCY dimension (a negative change), and historical information in the ACTIVITY dimension. The negative change in classroom observations may have been related to the selectivity of the experimental group and the change in historical information appeared to be due to the small non-significant negative change in the control group in combination with the small non-significant positive change in the experimental group rather than the absolute change in the experimental group.

The changes in meaning of pupils, administrators, and classroom observations more probably occurred as a result of the classroom observation aspect of the course, while changes in society, human beings, and historical information more probably were due to the content of the lectures and reading material. The change noted in teachers and American public schools may have been due to the observations, the course content, or the interaction of the two.

CHAPTER VI

DIFFERENCES IN THE SEMANTIC STRUCTURE OF VARIOUS SUBGROUPS

The purpose of this chapter is to compare the semantic structure of various subgroups within a group of students before they took an introductory course in education. At the time the study was conducted, students were assigned to sections of the course on a rather random basis, i.e., very little affected the assignment other than convenience in relation to the student's class schedule. If certain subgroups within the group taking the course had similar conceptual frameworks, it might be possible to group the students by other than a random assignment to facilitate instruction.

Therefore, four subgroups were determined according to factors that were thought to be related to differences in conceptual frameworks: age, sex, aspiration as determined by whether a decision had been made to enter the teaching profession, and number of prior college credits in social sciences.

Procedure for Comparing the Subgroups

The hypotheses tested in this part of the study were stated in null form:

H5A. At the beginning of a one-quarter course in education, there will be no significant difference among various age groups, (viz., less than 26, 26-35, greater than 35) in the factor scores that determine meaning of 20 educational concepts as measured by a semantic differential.

H5B. At the beginning of a one-quarter course in education, there will be no significance between males and females in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

H5C. At the beginning of a one-quarter course in education, there will be no significant difference between those who have definitely decided to become teachers and those who have not made this decision,in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

H5D. At the beginning of a one-quarter course in education, there will be no significant difference among those who have had varying backgrounds in the social sciences, (viz., less than 13 quarter credits, 13-24 credits, 25-36 credits, greater than 36 credits) in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Chi square was used as a test of significance for determining whether the distributions of the various subgroups could have been randomly drawn from the same population. A separate test was made for each concept by computing chi square on each factor and then summing across all factors.

To compute chi square on the first concept and the first factor, the 245 experimental Ss were first rank ordered according to the factor scores; the Ss were then divided into five groups which approximated quintiles (if there had been no tied scores, these groups would have been quintiles). The expected observation within each subgroup cell was then computed by the following formula

$$E = (n_i/245)\ n_a$$

where n_i was the number of Ss within the *i*th "quintile" and n_a was the number of Ss within the subgroup. Chi square was then computed. The same procedure was followed for the other factors on the first concept and the chi squares summed. The same procedure was followed for the other concepts for all subgroupings.

Data for Subgroupings by Age

As in previous chapters, the analysis was concerned with a "cloud" of points within a k-dimensional semantic space. The question in H5A was whether the three clouds representing three age groups' perceptions of a given concept were in a different location in the semantic space. These "clouds" might be different because of differences in their central tendency, but they also could be different because of their dispersion or shape of distribution about these central tendencies. Likewise, they might be located differently because of a difference in a given dimension, but they also might be located differently because of a difference along some diagonal between the factors. The chi square test, summed over all factors, was used for detecting any of these differences.

Ss were divided into three groups as specified by H5A; 211 of the Ss were less than 26 years old, 20 were 26-35, and 14 were greater than 35. Because of the small number of cases in the two older age categories and the consequent small numbers expected within the "quintiles", it was necessary to combine the two upper age groups prior to analysis. Hypothesis 5A was, therefore, modified to consider only two age groups (*viz*., less than 26 and greater than 25); the number in the two groups became 211 and 34, respectively. Data regarding the difference in meaning of the eight human concepts among the two age groups are presented in Table 6.1. In only one case was there a significant difference among the age groups in the meaning of a human concept. The younger age group, i.e., less than 26, considered *parents* as significantly more responsive (at the .05 level) than the older group.

Data regarding the difference in meaning of the 12 abstract concepts among the various age groupings are presented in Table 6.2. The following differences in meaning (at the .05 level) were noted: *class decisions* was rated as better in the EVALUATIVE dimension by the younger group; *learning* and *psychology* were rated as more active by the younger group.

Table 6.1

Differences in Mean Factor Scores of Eight Human Concepts

Between Two Age Groupings Before Treatment

Grouping By Age	Mean Factor Scores of Concepts Before Treatment							
	1	2	3	4	5	6	7	8
Factor I: EVALUATIVE								
25 & Below	2.36	2.49	2.15	2.95	2.39	2.65	2.14	2.93
Above 25	2.23	2.85	2.18	2.97	2.73	2.64	2.29	3.06
Chi Square	7.35	7.56	5.92	1.97	7.84	2.75	4.94	3.33
Factor II: RESPONSIVENESS								
25 & Below	3.05	2.52	2.36	2.71	3.29	2.64	2.39	3.55
Above 25	2.93	2.85	2.28	2.91	3.35	2.64	2.32	3.63
Chi Square	3.90	6.89	5.37	4.62	4.68	2.92	2.22	3.58
Factor III: POTENCY								
25 & Below	3.66	3.22	2.65	2.81	3.37	2.94	3.02	3.13
Above 25	3.71	3.77	3.07	3.19	3.60	3.11	3.13	3.18
Chi Square	2.49	15.35[b]	7.26	9.34	7.32	3.18	1.84	7.02
Summed Chi Square	13.74	29.80[b]	18.55	15.93	19.85	8.85	9.00	13.93

Concepts:
1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 6.2

Differences in Mean Factor Scores of Twelve Abstract Concepts

Between Two Age Groupings Before Treatment

Grouping By Age	Mean Factor Scores of Concepts Before Treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
Factor I: EVALUATIVE												
25 & Below	1.54	2.20	1.55	1.61	2.27	1.55	1.96	2.03	2.10	2.54	2.39	1.79
Above 25	1.53	2.13	1.77	1.74	2.24	1.64	2.28	2.30	2.27	2.83	2.81	2.10
Chi Square	6.47	4.40	2.51	9.09	3.14	7.32	5.42	5.46	3.94	4.23	10.25[a]	3.49
Factor II: POTENCY												
25 & Below	2.65	3.31	2.81	2.75	2.73	2.79	3.83	3.03	3.28	3.05	3.20	3.44
Above 25	2.59	3.35	2.78	3.06	2.85	2.89	4.15	3.19	3.50	3.42	3.38	3.67
Chi Square	5.18	1.37	3.00	7.32	3.81	3.02	3.26	2.88	2.70	6.00	3.24	2.62
Factor III: ACTIVITY												
25 & Below	2.35	3.35	2.72	2.84	3.99	2.98	2.84	3.56	3.51	3.69	3.16	2.82
Above 25	2.18	3.29	2.92	2.72	3.76	3.17	3.39	3.50	3.77	3.49	3.55	3.12
Chi Square	3.33	0.98	2.72	5.99	3.06	7.26[a]	12.21	0.95	9.05	1.42	9.44	12.31[a]
Factor IV: COGNITIVE												
25 & Below	3.26	3.17	3.40	3.10	2.96	3.24	3.93	3.50	3.98	3.06	3.58	3.37
Above 25	3.13	2.88	3.56	3.07	3.18	3.06	3.97	3.47	3.96	2.91	3.56	3.51
Chi Square	1.79	6.92	2.37	0.53	3.29	6.46	0.36	3.47	0.44	4.41	0.37	2.16
Summed Chi Square	16.76	13.67	10.61	22.93	13.30	24.07	21.26	12.75	16.13	16.06	23.30	20.58

Concepts:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

a .05 level of significance
b .01 level of significance
c .001 level of significance

Therefore, of the 72 chi square tests conducted for the 20 concepts and the two age groupings, significant differences at the .05 level were found in four cases. The chance probability of obtaining at least three statistics significant at the .05 level from 72 calculated statistics is approximately .40 (Sakoda, et al., 1954).

Data for the Subgroupings by Sex

Data regarding the difference in meaning of the eight human concepts between males and females are presented in Table 6.3. Five of the eight concepts were viewed as significantly better in the EVALUATIVE dimension by females. The other three concepts were rated better by females, but were not significant at the .05 level. No differences were noted in the other dimensions, although the sum of the chi squares was significantly different at the .05 level for teacher.

Data regarding the difference in meaning of the 12 abstract concepts between males and females are presented in Table 6.4. All of the 12 abstract concepts were rated better in the EVALUATIVE dimension by females, and 11 of the 12 were significantly different at the .05 level or less. Cadet teaching and learning were rated as significantly more responsive by females; philosophical beliefs and psychology were rated as significantly more potent by females; teaching was rated as significantly less rational by females.

Therefore, of the 72 chi square tests conducted for the 20 concepts and the sex groupings, significant differences were found at the .05 level in 21 cases, and 15 of these 21 were significantly different at the .01 level. The chance probability of obtaining at least 21 statistics significant at the .05 level and of obtaining 15 statistics significant at the .01 level from 72 calculated statistics is less than .001 (Sakoda, et al., 1954).

Data for the Subgroupings by Aspiration

At the beginning of the course, the Ss were asked whether they had definitely decided to become teachers. Those who indicated they had definitely decided to become teachers were put in one group, and all others were in the second group. Data regarding the differences in meaning of the eight human concepts to the two groups are presented in Table 6.5. Although the group that had decided to become teachers rated all of the human concepts better in the EVALUATIVE dimension than those who had not made this decision, only one concept, pupils, was significantly better. No differences were found in the other two dimensions.

Data regarding the differences in meaning of the 12 abstract concepts to the subgroupings by aspiration are presented in Table 6.6. Those students who aspired to be teachers generally rated the abstract concepts better in the EVALUATIVE dimension than other Ss, and cadet teaching, education, and historical information were rated significantly better. In the POTENCY dimension, Ss who aspired to be teachers rated learning more potent than other Ss.

Table 6.3

Differences in Mean Factor Scores of Eight Human Concepts Between Sexes Before Treatment

Grouping By Sex	Mean Factor Scores of Concepts Before Treatment							
	1	2	3	4	5	6	7	8
Factor I: EVALUATIVE								
Male	2.59	2.90	2.38	3.08	2.67	2.76	2.35	3.32
Female	2.23	2.38	2.05	2.90	2.33	2.60	2.07	2.78
Chi Square	14.60[b]	20.69[c]	8.06	2.60	10.47[a]	6.42	9.98[a]	19.76[c]
Factor II: RESPONSIVENESS								
Male	3.11	2.72	2.47	2.81	3.33	2.59	2.50	3.70
Female	3.00	2.49	2.30	2.71	2.29	2.66	2.33	3.50
Chi Square	1.83	7.01	9.32	0.43	5.44	1.64	2.61	4.48
Factor III: POTENCY								
Male	3.67	3.42	2.74	2.93	3.41	3.11	2.98	3.25
Female	3.67	3.24	2.70	2.83	3.40	2.90	3.07	3.09
Chi Square	5.85	6.90	6.99	1.94	1.45	4.31	3.52	1.95
Summed Chi Square	22.28[a]	34.59[c]	24.38[a]	4.97	17.36	12.37	16.11	26.19[a]

Concepts:
1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 6.4

Differences in Mean Factor Scores of Twelve Abstract Concepts

Between Sexes Before Treatment

Grouping by Sex	Mean Factor Scores of Concepts Before Treatment 1	2	3	4	5	6	7	8	9	10	11	12
Factor I: EVALUATIVE												
Male	1.71	2.32	1.80	1.78	2.32	1.71	2.33	2.33	2.33	2.87	2.66	2.09
Female	1.47	2.13	1.48	1.56	2.24	1.49	1.87	1.95	2.04	2.45	2.36	1.72
Chi Square	24.00[c]	5.83	21.91[c]	21.44[c]	11.18[a]	10.49[a]	21.39[c]	23.96[c]	15.20[b]	11.12[a]	14.52[b]	15.79[b]
Factor II: POTENCY												
Male	2.90	3.37	3.02	2.91	2.97	3.09	4.04	3.25	3.52	3.31	3.32	3.72
Female	2.53	3.30	2.71	2.74	2.64	2.67	3.80	2.96	3.21	3.00	3.18	3.36
Chi Square	9.35	2.49	10.95[a]	4.57	5.76	10.72[a]	3.92	5.50	8.61	7.74	3.40	9.35
Factor III: ACTIVITY												
Male	2.42	3.44	2.93	2.98	3.89	3.14	3.29	3.59	3.71	3.79	3.27	3.13
Female	2.28	3.29	2.66	2.76	3.98	2.95	2.75	3.52	3.48	3.61	3.19	2.74
Chi Square	1.97	2.24	6.66	8.22	1.66	3.45	19.62[c]	3.02	6.32	4.05	0.83	14.88[b]
Factor IV: COGNITIVE												
Male	3.17	3.20	3.35	2.97	3.15	3.31	3.79	3.54	4.03	3.21	3.43	3.42
Female	3.28	3.10	3.45	3.15	2.92	3.17	4.00	3.45	3.95	2.97	3.64	3.38
Chi Square	13.92[b]	1.68	8.98	5.53	1.27	0.60	3.88	4.62	1.28	3.48	2.25	5.22
Summed Chi Square	49.24[c]	12.23	48.49[c]	39.77[c]	19.87	25.26	48.81[c]	37.10[b]	31.41[a]	26.40[a]	21.01	45.24[c]

Concepts:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 6.5

Differences in Mean Factor Scores of Eight Human Concepts Between Two Groupings By Aspiration Before Treatment

Grouping By Aspiration	Mean Factor Scores of Concepts Before Treatment							
	1	2	3	4	5	6	7	8
Factor I: EVALUATIVE								
Decision to teach	2.26	2.52	2.07	2.91	2.41	2.57	2.10	2.90
No decision	2.64	2.63	2.44	3.10	2.52	2.94	2.38	3.12
Chi Square	9.60[a]	5.48	8.16	5.92	1.45	7.19	7.28	2.00
Factor II: RESPONSIVENESS								
Decision to teach	2.96	2.54	2.29	2.72	3.24	2.60	2.33	3.50
No decision	3.29	2.66	2.59	2.80	3.52	2.79	2.57	3.78
Chi Square	6.65	3.53	6.02	1.68	4.23	5.44	3.92	4.65
Factor III: POTENCY								
Decision to teach	3.62	3.26	2.68	2.86	3.40	2.92	3.00	3.12
No decision	3.87	3.43	2.81	2.88	3.39	3.14	3.19	3.19
Chi Square	5.94	5.88	1.78	3.04	3.07	4.32	3.48	4.83
Summed Chi Square	22.19[a]	14.89	15.96	10.64	8.75	16.95	14.68	11.48

Concepts:
1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Table 6.6

Differences in Mean Factor Scores of Twelve Abstract Concepts
Between Two Groupings by Aspiration Before Treatment

Grouping By Aspiration	Mean Factor Scores of Concepts Before Treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
Factor I: EVALUATIVE												
Decision to teach	1.51	2.13	1.52	1.57	2.18	1.53	2.02	2.00	2.10	2.51	2.46	1.84
No decision	1.66	2.39	1.79	1.84	2.59	1.66	1.96	2.33	2.22	2.82	2.42	1.82
Chi Square	6.88	8.27	10.52[a]	12.08[a]	11.07[a]	8.43	8.08	7.58	2.02	1.91	2.09	5.69
Factor II: POTENCY												
Decision to teach	2.58	3.27	2.75	2.72	2.66	2.73	3.84	2.96	3.22	3.04	3.18	3.41
No decision	2.89	3.48	3.03	3.07	3.04	3.07	3.99	3.40	3.65	3.32	3.37	3.68
Chi Square	7.20	2.18	8.82	3.09	8.14	10.32[a]	2.47	6.49	4.68	3.49	2.10	1.71
Factor III: ACTIVITY												
Decision to teach	2.28	3.31	2.66	2.80	3.90	3.03	2.94	3.35	3.51	3.64	3.22	2.83
No decision	2.47	3.45	3.04	2.99	4.16	2.94	2.80	3.34	3.70	3.75	3.20	2.99
Chi Square	4.52	5.31	9.19	1.89	3.84	5.37	2.16	1.02	2.64	1.68	0.07	7.37
Factor IV: COGNITIVE												
Decision to teach	3.23	3.12	3.40	3.07	2.93	3.24	3.90	3.48	3.90	2.98	3.16	3.30
No decision	3.31	3.14	3.47	3.19	3.21	3.10	4.07	3.49	4.26	3.29	3.63	3.74
Chi Square	2.79	0.79	2.00	6.40	2.09	5.32	4.07	3.50	4.73	3.44	1.76	4.10
Summed Chi Square	21.38	16.55	30.53[a]	23.45	25.14	29.64[a]	16.77	18.59	14.07	10.77	6.79	10.88

Concepts:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

[a] .05 level of significance
[b] .01 level of significance
[c] .001 level of significance

Therefore, of the 72 chi square tests conducted for the 20 concepts and the groupings by aspirations, significant differences at the .05 level were found in five cases. The chance probability of obtaining at least five statistics significant at the .05 level from 72 calculated statistics is approximately .30 (Sakoda, et al., 1954).

Data for Subgroupings by Prior Courses

At the beginning of the course, the Ss were asked the amount of prior course work they had in psychology, sociology, philosophy, history, political science, and economics; for purposes of computation, Ss were then divided into four groupings as specified in H5D. Data regarding the differences in meaning of the eight human concepts to the subgroupings are presented in Table 6.7. No differences in meaning of the various concepts were found among the various groupings.

Data regarding the differences in meaning of the 12 abstract concepts to the subgroupings by the amount of background in social sciences are presented in Table 6.8. The following differences were found: cadet teaching was rated better in the EVALUATIVE dimension by Ss who had fewer credit hours in social sciences, but there was not a trend among the four groupings; cadet teachers was rated more potent by the group with 13-24 credit hours in social science, but there was not a trend relating to credits obtained. American public schools was rated as more rational by the group with 0-12 credit hours in social science, but there was not a trend relating to credits; classroom observations was rated as less rational by the group with 13-24 credit hours, but there was not a trend relating to credits obtained.

Therefore, of the 72 chi square tests conducted for the 20 concepts and the groupings by prior courses, significant differences at the .05 level were found in four cases. The chance probability of obtaining at least four statistics significant at the .05 level from 72 calculated statistics is approximately .40 (Sakoda, et al., 1954).

Discussion of the Results

Younger people tend toward idealism; females tend toward emotionalism and motherly protectiveness; those who aspire to teach tend toward altruism; and those with a broad social science background tend to view social institutions more realistically. If one were to accept the above statement as true, he would expect to find significant differences among groupings of education students by age, sex, aspiration, and prior courses in social science. Only in the case of the subgroupings by sex do the results of this study appear to have some generalizable significance that warrants further investigation, but other differences do appear to warrant discussion.

For example, in the few cases where differences were found in the age groupings, (viz., parents, class decisions, psychology and learning) the findings appear to indicate the enthusiasm and idealism of youth. However, the differences found were not greater than what one might expect to find by chance. If differences among ages do exist, it may be

Table 6.7

Differences in Mean Factor Scores of Eight Human Concepts Among Four Groupings By Prior Courses Before Treatment

Credits in Social Sciences	Mean Factor Scores of Concepts Before Treatment 1	2	3	4	5	6	7	8
Factor I: EVALUATIVE								
0-12	2.46	2.26	2.19	2.79	2.51	2.58	2.30	2.96
13-24	2.22	2.48	2.08	2.97	2.33	2.65	2.12	2.83
25-36	2.43	2.39	2.07	2.97	2.29	2.63	2.04	2.78
Above 36	2.51	2.88	2.30	3.06	2.65	2.74	2.20	3.27
Chi Square	9.48	16.25	8.47	8.46	15.13	9.57	11.33	12.35
Factor II: RESPONSIVENESS								
0-12	3.06	2.50	2.34	2.58	3.48	2.71	2.40	3.48
13-24	2.99	2.52	2.31	2.84	3.29	2.67	2.34	3.57
25-36	3.05	2.38	2.37	2.77	3.14	2.61	2.37	3.49
Above 36	3.06	2.08	2.41	2.72	3.31	2.53	2.43	3.71
Chi Square	8.20	20.21	13.45	4.16	12.80	11.93	1.38	5.48
Factor III: POTENCY								
0-12	3.70	2.94	2.60	2.65	3.35	2.90	2.85	3.15
13-24	3.76	3.38	2.83	2.89	3.52	2.98	3.19	3.08
25-36	3.63	3.40	2.67	3.02	3.25	3.01	3.02	3.17
Above 36	3.54	3.39	2.69	2.86	3.44	2.96	3.02	3.17
Chi Square	5.10	10.14	10.39	8.42	18.35	8.71	11.84	5.36
Summed Chi Square	22.78	46.60	32.31	21.04	46.28	30.20	24.55	23.20

Concepts:
1 = Pupils
2 = Parents
3 = Teacher
4 = Administrators
5 = Human Beings
6 = Education Instructors
7 = Myself
8 = Society

a .05 level of significance
b .01 level of significance
c .001 level of significance

Table 6.8

Differences in Mean Factor Scores of Twelve Abstract Concepts

Among Four Groupings by Prior Courses Before Treatment

Credits in Social Sciences	Mean Factor Scores of Concepts Before Treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
Factor I: EVALUATIVE												
0-12	1.51	2.12	1.48	1.49	2.41	1.53	1.96	2.07	2.07	2.43	2.33	1.70
13-24	1.46	2.21	1.56	1.60	2.20	1.57	1.98	2.06	2.16	2.48	2.33	1.84
25-36	1.58	2.19	1.48	1.47	2.29	1.48	2.05	2.09	2.07	2.63	2.46	1.81
Above 36	1.45	2.23	1.42	1.76	2.07	1.65	2.07	2.26	2.20	2.81	2.73	1.89
Chi Square	8.43	6.88	32.10^{b}	16.12	12.23	8.10	10.79	16.79	10.72	11.25	12.98	6.92
Factor II: POTENCY												
0-12	2.76	3.16	2.74	2.67	2.65	2.74	3.42	2.88	3.22	3.02	3.18	3.44
13-24	2.67	3.42	2.91	2.69	2.69	2.74	3.88	3.04	3.28	3.03	3.26	3.49
25-36	2.94	3.40	2.72	2.98	2.89	2.88	4.02	3.08	3.27	3.16	3.17	3.44
Above 36	2.67	3.23	2.80	2.89	2.73	2.87	3.81	3.12	3.48	3.23	3.27	3.30
Chi Square	12.45	13.77	22.22^{a}	11.15	12.16	10.42	10.73	10.39	16.96	7.86	5.13	4.18
Factor III: ACTIVITY												
0-12	2.31	3.36	2.60	2.91	4.28	3.23	2.94	3.56	3.51	3.70	3.38	2.93
13-24	2.26	3.30	2.72	2.71	4.00	3.00	2.86	3.56	3.53	3.63	3.06	2.81
25-36	2.21	3.18	2.70	2.80	3.78	2.88	2.86	3.32	3.40	3.24	3.12	2.70
Above 36	2.28	3.25	2.80	2.80	3.76	2.91	3.01	3.58	3.68	3.77	3.48	3.03
Chi Square	13.03	8.01	10.16	6.03	12.03	7.53	6.21	17.90	11.07	10.36	13.00	16.33
Factor IV: COGNITIVE												
0-12	3.27	2.90	3.49 *	3.19	2.87	3.01	3.93	3.42	2.73	2.85	3.46	3.30
13-24	3.57	3.28	3.58	3.27	3.15	3.56	4.12	3.59	4.03	3.16	3.71	3.51
25-36	3.06	3.04	3.38	3.06	2.96	2.80	3.85	3.41	4.12	3.40	3.08	3.41
Above 36	2.94	3.22	3.15	2.79	2.90	3.36	3.77	3.46	3.98	3.09	3.40	3.00
Chi Square	19.36	26.49^{b}	15.38	20.40	8.06	13.09	9.82	23.77^{a}	6.39	9.07	10.46	19.17
Summed Chi Square	53.25	56.36	79.80^{b}	51.70	44.43	38.86	37.56	71.85^{a}	44.26	37.23	41.97	46.80

Concepts:
1 = Teaching
2 = American Public Schools
3 = Cadet Teaching
4 = Education
5 = Historical Information
6 = Learning
7 = Philosophical Beliefs
8 = Classroom Observations
9 = Ethics
10 = Education Courses
11 = Class Decisions
12 = Psychology

a .05 level of significance
b .01 level of significance
c .001 level of significance

that the age grouping was such that it did not approximate differences within the total group. If so, additional investigation of differences that exist among the Ss in the age category less than 25 would probably be more profitable. It is more probable, however, that differences in meaning of the 20 concepts studied do not exist to the extent that it would be profitable to regroup students by age for instructional purposes.

In general, those who indicated that they had definitely decided to be teachers viewed the concepts as better than those who had not decided to become teachers. Only four of the 20 concepts were significantly different in the EVALUATIVE dimension, however. Likewise, only one of the concepts was significantly more potent than the other concepts. Although these differences are in the direction one might expect, the chance probability of obtaining this number of significant differences is approximately .30; this indicates that grouping according to the aspiration variable would probably not facilitate instruction. These results should not be interpreted to mean that no significant difference exists in the meaning of the concepts studied between: (a) those who aspire to be teachers, and (b) all other college students; rather, the lack of significant difference existed between two groups of students who had chosen an education course: (a) those who had indicated they had definitely decided to be teachers, and (b) those who had not decided to become teachers. The latter group may or may not eventually decide to become teachers and, therefore, should not be considered to be the same as *all other college students*.

There appeared to be even less relationship between the variable of prior courses in social science and the meaning of educational concepts than was found for the variables of age and aspiration. Although four concepts were significantly different (chance probability of finding this number of significant differences is approximately .40) among the four groupings with various social science credits, there was no indication that additional course work was related to differences in meaning; nor was there evidence that the differences found were attributable to a given group. It was concluded that grouping of beginning education students according to credits in social sciences would probably not appreciably facilitate instruction.

The conceptual differences found between sexes were more significant; likewise, the interpretation of these differences is more difficult. The difficulty centers in knowing why these differences occurred. First, let us examine the differences.

Of the 21 differences found in the dimensions (i.e., ignoring the summed chi squares), 16 occurred in the EVALUATIVE dimension. All of the other five differences were found among the abstract concepts--females rated *cadet teaching* and *learning* more potent, *philosophical beliefs* and *psychology* more active, and *teaching* less rational. Are these findings compatible with prior descriptions of females? If so, are the differences inherent female characteristics or are they culturally related? If so, are the differences inherent female characteristics or are they culturally related? Also, are females likely to respond to different instructional treatment because of these conceptual differences?

The findings do not seem to be incompatible with what is known about differences between sexes. Tyler (1947, p. 249) indicates that girls consistently make better school records than boys; and that even in areas where boys usually score higher on tests (such as mathematics, science, geography, and history), girls often receive better marks than boys when these marks are based on teachers' judgments. In general, teachers appear to be influenced positively by docility and submissiveness. It may be that the general cultural and social attitudes toward girls promote the development of characteristics such as docility, submissiveness, and conformity, and that these feminine traits lead to more positive rewards from the school. If so, girls would receive greater satisfaction from school and their general response set for a class of concepts directly related to schools would tend to be more positive than for males.

However, additional differences between sexes would indicate (Tyler, 1947, p. 262) that women tend to be less stable emotionally (on both pencil-and-paper questionnaires and clinical diagnoses), and that they have a tendency to be more willing to confess what their emotional difficulties are. These findings appear to be compatible with an interpretation of "passive-acceptance" postulated as an explanation of a reluctance on the part of women to utilize perceptual cues to analyze implausible situations.

If, then, females tend to be less stable emotionally, to be more willing to confess emotional difficulties, and to utilize a "passive-acceptance" procedure, they may adopt an agreeing-response set. Couch and Keniston (1960) describe the person with a general agreeing-response set as being a person with diffuse anxiety that suggests a seeking of dependency on external figures for support, with little concern for control of their impulses, and with a desire for emotional excitement. They, therefore, "were shown to be individuals with weak ego controls, who accept impulses without reservation, and who 'agree' and easily respond to stimuli exerted on them." These personality characteristics of yea-sayers appear to be harmonious with female characteristics.

It was concluded that the differences found between sexes on the concepts studied were compatible with what is known about differences between males and females, that a plausible cause of the differences found may be the differential treatment of boys and girls over a long period of time in a school setting, and that this differential treatment of males and females by the culture may induce personality characteristics that are related to a general agreeing-response set. The question of whether grouping by sex would improve learning in education courses in colleges is worthy of additional investigation.

Summary

The purpose of this chapter was to compare the semantic structure of various subgroups within a group of students before they took an introductory course in education. Four subgroups were determined according to factors that were thought to be related to differences in conceptual frameworks: age, sex, aspiration as determined by whether a decision had been made to enter the teaching profession, and number of prior college credits in social sciences.

Chi square was used as a test of significance for determining whether the distributions of the various subgroups could have been randomly drawn from the same population. A separate test was made for each concept by computing chi square on each factor and then summing across all factors. The groupings by age, aspiration, and number of prior college credits in social sciences yielded some differences in meaning; however, the chance probability of obtaining the number of significant differences found was not less than .30 in any instance. It was concluded that grouping by these variables would probably not facilitate instruction.

The differences found between sexes were more significant. Females rated all concepts better in the EVALUATIVE dimension, and rated 16 of the 20 concepts significantly better. This indicated a definite difference in attitudes of females toward educational concepts. Also, five of the 12 abstract concepts were rated significantly more positive by females.

It was concluded that the differences found between sexes on the concepts studied was compatible with what is known about differences between males and females, that a plausible cause of the differences found is the differential treatment of boys and girls over a long period of time in a school setting, and that this differential treatment of males and females by the culture may induce personality characteristics that are related to a general agreeing-response set. The question of whether grouping by sex would improve learning in education courses in college is worthy of additional investigation.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The Problem

In order to learn more about the general conceptual frame of reference of the college student who intends to go into teaching, and particularly about his perception of educational concepts, a study was conducted for the following purposes:

1. To determine similarities and differences in the meaning of various concepts--all directly related to education--held by persons taking an introductory course in education.

2. To determine whether the meanings of these concepts changed during the course.

3. To determine whether various subgroups within the total group had different semantic structural frameworks.

The definition of meaning used was developed by Osgood and his associates, who employed a semantic differential consisting of bipolar adjectives for describing a concept; the weightings attached to the various adjectives determined the meaning of the concept to the individual.

The information provided by this study is distinctive in that it furnished: (a) a measure of changes in meaning during a period of instruction rather than during therapy or following a single communication, (b) a foundation for work that will relate behavioral change to semantic change, (c) information regarding the meaning of a specific class of concepts that have peculiar meaning to the field of professional education, and (d) objective information regarding the degree of identification students have with the profession.

Objectives

In order to determine whether the meanings of the various concepts changed during the course, the following null hypothesis was tested:

Hypothesis 1. For beginning students in education, there is no significant change in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential during a one-quarter course in education.

In order to determine similarities and differences in the meaning of the various concepts, the following hypotheses were tested:

Hypothesis 2. At the beginning of a one-quarter course in education, students perceive no significant difference in the distance between each pair of the 20 concepts in the semantic space as measured by a semantic differential.

Hypothesis 3. At the end of a one-quarter course in education, students perceive no significant difference in the distance between each pair of 20 concepts in the semantic space as measured by a semantic differential.

Hypothesis 4. Beginning students perceive no significant difference in the distance between a given concept, when measured at the beginning of a course in education, and any of 19 other educational concepts, when measured at the end of the course, in the semantic space as measured by a semantic differential.

In order to determine differences among the various subgroupings, the following hypotheses were tested:

Hypothesis 5A. At the beginning of a one-quarter course in education, there is no significant difference among various age groups, (*viz*., less than 26, 26-35, greater than 35) in the factor scores that determine meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5B. At the beginning of a one-quarter course in education, there is no significant difference between males and females in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5C. At the beginning of a one-quarter course in education, there is no significant difference between those who have definitely decided to become teachers and those who have not made this decision, in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

Hypothesis 5D. At the beginning of a one-quarter course in education, there is no significant difference among those who have had varying backgrounds in the social sciences, (*viz*.less than 13 quarter credits, 13-24 credits, 25-36 credits, greater than 36 credits) in the factor scores that determine the meaning of 20 educational concepts as measured by a semantic differential.

The design of the study was a before-after, one-control quasi-experiment in which the control and experimental subjects were nonequivalent in the sense of having been randomly assigned to their groups. The experimental group consisted of 245 students enrolled in an introductory course in education at the University of Washington. The control group consisted of 68 volunteer students in introductory courses in speech and English. A semantic differential was devised and administered to both groups at the beginning and end of a quarter.

The concepts utilized in the study were selected by the investigator and graduate students. Relevance to the social foundations content of the course, to the undergraduate student's conceptual frame of reference in relation to teaching, and to common negative attitudes that might be changed as a result of information were used as criteria for selection. The concepts selected were: pupils, parents, teachers, society, administrators, human beings, education instructors, myself, teaching, American public schools, cadet teaching, education, historical information, learning, philosophical beliefs, classroom observations, ethics, education courses, class decisions, and psychology. Twelve of these concepts are abstract, while eight of them are human. The analysis of the two types of concepts was separate throughout the study. The scales used in the study were selected for their relevance to the particular class of concepts being judged and to the major dimensions found in prior studies.

The introductory course in education was the treatment in the experiment. It consisted of lecture periods, visits to public schools, and independent reading of common materials.

Analysis of the data included principal axis factor analyses (with rotation to simple structure via Kaiser's varimax), the development of a procedure for determining common factors, the computation of factor scores and difference scores, and the utilization of the following nonparametric tests of significance: Kruskal-Wallis, Wilcoxon matched-pair signed ranks, Mann Whitney U, and Chi Square. A procedure suggested by Osgood (1957) and a formula suggested by Horst (1949) were used for checking the reliability of the instrument.

Results and Conclusions

The semantic differential is a useful tool for measuring differences and changes in concepts for a group. The semantic differential is reliable (discussion of reliability in Appendix), discriminates finely, and permits precision regarding the nature of differences and changes.

During this study, a procedure was developed for the analysis of data characterized by four types of classifications: entities (students), attributes (scales), occasions (time 1 and time 2), and conditions (concepts). Four factors were identified that were consistent enough for comparison of the 12 abstract concepts. These four factors were labeled EVALUATIVE, POTENCY, ACTIVITY, and COGNITIVE. Three factors were identified that were consistent enough for comparison of the eight human concepts. These three factors were labeled EVALUATIVE, RESPONSIVENESS, and POTENCY.

The factors identified in this study are harmonious with factors identified by others who have used the semantic differential. The identification of a RESPONSIVENESS factor is a departure from more generalized instruments, and may have resulted from the nature of the class of concepts being considered.

Ss perceived the comparable abstract and human concepts as significantly different at t1 and t2. The data indicated within which dimensions the students perceived the differences.

Comparison of the human concepts indicated that at t1, the Ss' self-concept, *myself*, was not significantly different from *teacher* in the EVALUATIVE and RESPONSIVENESS dimensions, but *teacher* was rated more potent than *myself* in the POTENCY dimension. This means that beginning students in education identify closely with the teaching profession, and the differences in meaning that did exist between *teacher* and *myself* may mean that the Ss perceived themselves as being as good and as responsive as teachers, but without the strength of teachers in the sense of being able to influence or have control over others.

Comparison of the abstract concepts indicated that two groups of abstract concepts existed. Analysis of the results of the rankings in one of these groups indicated that beginning students in education appeared to be saying that *American public schools* are not as good, as potent, or as active as *teaching*, *cadet teaching*, *education*, or *learning*. However, *American public schools* are as rational as *teaching*, *learning*, and *education*, and more rational than *cadet teaching*. These results may provide a clue to one of the motivations for going into the teaching profession. If a beginning student perceives *teaching* and *education* as good, potent, and active, but perceives *American public schools* as less good, less potent, and less active, then he may be entering the profession for the specific purpose of modifying the American public school in the direction of his own perception of teaching and education.

In the second group of abstract concepts, *psychology* and *philosophical beliefs* were rated better and more active than *historical information* and *education courses*, but *historical information* and *education courses* were considered more potent and more rational than *psychology* and *philosophical beliefs*. Likewise, it is interesting to note that all four of the Group One concepts that rated better than *education courses* in the EVALUATIVE dimension actually are component parts or are foundational aspects of education courses. This means that beginning education students have a relatively negative attitude (as determined by the EVALUATIVE dimension) toward education courses in comparison to the actual content of the courses. There was no inference from the data regarding the cause(s) of this attitude; however, when the component parts of education courses are considered to be better than the courses themselves, then additional investigation to determine the causes of these relationships appears to be warranted.

Changes in the human concepts that could be attributed to the treatment included: *pupils* (in the EVALUATIVE dimension), *administrators* (in the EVALUATIVE and RESPONSIVENESS dimensions), and *human beings* (in the EVALUATIVE dimension). The changes in *teacher* and *human beings* resulted from negative changes in the control group rather than the absolute change in the experimental group. Changes in *pupils* and *human beings* in the EVALUATIVE dimension may have been related to the selectivity of the experimental group rather than to treatment.

Changes in the abstract concepts that could be attributed to the treatment included: *American public schools* in the EVALUATIVE dimension, *classroom observations* in the POTENCY dimension (a negative change), and *historical information* in the ACTIVITY dimension. The negative change in *classroom observations* may have been related to the selectivity of the experimental group, and the change in *historical information* appeared to be caused by the small non-significant negative change in the control group in combination with the small non-significant positive change in the experimental group rather than the absolute change in the experimental group.

Most of the changes in the control group were negative changes. Since the control group was mainly a mixture of freshman and sophomore students, it may be that internal maturational factors affected this age group to the extent that they reacted negatively to ideas toward which they previously had reacted more positively. It may be that their educational experiences were such that they were beginning to challenge concepts that they had accepted previously--that they were questioning preconceived ideas as a result of the challenges being offered by their instructors and their own age group. The causes of these negative changes warrant further study.

The changes in meaning of *pupils*, *administrators*, and *classroom observations* more probably occurred as a result of the classroom observations aspect of the course, whereas changes in *society*, *human beings*, and *historical information* more probably were caused by the content of the lectures and reading material. The change noted in *teachers* and *American public schools* may have been caused by the observations, the course content, or the interaction of the two.

The comparison of groupings by age, aspiration, and number of prior college credits in social sciences yielded some differences in meaning; however, the chance probability of obtaining the number of significant differences found was not less than .30 in any instance. It was concluded that grouping by these variables would probably not facilitate instruction.

The differences found between sexes were more significant. Females rated all concepts better in the EVALUATIVE dimension, and rated 16 of the 20 concepts significantly better. This indicated a definite difference in attitudes of females toward educational concepts. Also, five of the 12 abstract concepts were rated significantly more positive by females.

It was concluded that the differences found between sexes on the concepts studied was compatible with what is known about differences between males and females, that a plausible cause of the differences found is the differential treatment of boys and girls over a long period of time in a school setting, and that this differential treatment of males and females by the culture may induce personality characteristics that are related to a general agreeing-response set. The question of whether grouping by sex would improve learning in education courses in college is worth additional investigation.

APPENDIX A

ILLUSTRATION OF THE INSTRUMENT USED FOR MEASURING THE MEANING OF EDUCATIONAL CONCEPTS

This appendix includes the instructions used for administering the semantic differential, a set of scales used for the human concepts (illustrated with the concept pupils), a set of scales used for the abstract concepts (illustrated with the concept teaching), and two sheets used for collecting information regarding the Ss.

Instructions: The purpose of this study is to measure the meanings of certain things to various people by having them judge them against a series of descriptive scales. In doing this task, please make your judgments on the basis of what these things mean to you. On each page of this booklet you will find a different concept to be judged and beneath it a set of scales. You are to rate the concept on each of these scales in order.

Here is how you are to use these scales: If you feel that the concept at the top of the pages is very closely related to one end of the scale, you should place your check mark as follows:

fair __X__:_____:_____:_____:_____:_____:_____ unfair

or

fair _____:_____:_____:_____:_____:_____:__X__ unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your check mark as follows:

strong _____:__X__:_____:_____:_____:_____:_____ weak

or

strong _____:_____:_____:_____:_____:__X__:_____ weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active _____:_____:__X__:_____:_____:_____:_____ passive

or

active _____:_____:_____:_____:__X__:_____:_____ passive

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the thing you're judging.

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or if the scale is completely irrelevant, unrelated to the concept, then you should place your check mark in the middle space.

safe _____:_____:_____:__X__:_____:_____:_____ dangerous

IMPORTANT: (1) Place your check marks in the middle of spaces, not on the boundaries:

THIS NOT THIS

_____:_____:__X__:_____:_____X_____:_____

(2) Be sure you check every scale for every concept--do not omit any.

(3) Never put more than one check mark on a single scale.

Sometimes you may feel as though you've had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not try to remember how you checked similar items earlier in the task. Make each item a separate and independent judgment. Work at fairly high speed through this task. Do not worry or puzzle over individual items. It is your first impressions, the immediate "feelings" about the items, that we want. On the other hand, please do not be careless, because we want your true impressions.

PUPILS

1. unpleasant _____:_____:_____ _____ _____:_____:_____ pleasant
2. passive _____:_____:_____ _____ _____:_____:_____ active
3. valuable _____:_____:_____ _____ _____:_____:_____ worthless
4. stable _____:_____:_____ _____ _____:_____:_____ changeable
5. contented _____:_____:_____ _____ _____:_____:_____ discontented
6. aggressive _____:_____:_____ _____ _____:_____:_____ defensive
7. mechanical _____:_____:_____ _____ _____:_____:_____ creative
8. incompetent _____:_____:_____ _____ _____:_____:_____ competent
9. tough _____:_____:_____ _____ _____:_____:_____ fragile
10. complex _____:_____:_____ _____ _____:_____:_____ simple
11. obedient _____:_____:_____ _____ _____:_____:_____ disobedient
12. colorless _____:_____:_____ _____ _____:_____:_____ colorful
13. following _____:_____:_____ _____ _____:_____:_____ leading
14. sophisticated _____:_____:_____ _____ _____:_____:_____ naive
15. sincere _____:_____:_____ _____ _____:_____:_____ insincere
16. free _____:_____:_____ _____ _____:_____:_____ constrained
17. emotional _____:_____:_____ _____ _____:_____:_____ rational
18. disrespectful _____:_____:_____ _____ _____:_____:_____ respectful
19. indifferent _____:_____:_____ _____ _____:_____:_____ curious
20. contrary _____:_____:_____ _____ _____:_____:_____ agreeable
21. unselfish _____:_____:_____ _____ _____:_____:_____ selfish
22. prohibitive _____:_____:_____ _____ _____:_____:_____ permissive
23. motivated _____:_____:_____ _____ _____:_____:_____ aimless
24. insensitive _____:_____:_____ _____ _____:_____:_____ sensitive
25. organized _____:_____:_____ _____ _____:_____:_____ disorganized
26. pessimistic _____:_____:_____ _____ _____:_____:_____ optimistic

TEACHING

1. easy _____:_____:_____|_____|_____:_____:_____ difficult
2. passive _____:_____:_____|_____|_____:_____:_____ active
3. efficient _____:_____:_____|_____|_____:_____:_____ inefficient
4. stable _____:_____:_____|_____|_____:_____:_____ changeable
5. direct _____:_____:_____|_____|_____:_____:_____ circuitous
6. certain _____:_____:_____|_____|_____:_____:_____ uncertain
7. colorless _____:_____:_____|_____|_____:_____:_____ colorful
8. following _____:_____:_____|_____|_____:_____:_____ leading
9. mechanical _____:_____:_____|_____|_____:_____:_____ creative
10. valuable _____:_____:_____|_____|_____:_____:_____ worthless
11. vigorous _____:_____:_____|_____|_____:_____:_____ feeble
12. complex _____:_____:_____|_____|_____:_____:_____ simple
13. intuitive _____:_____:_____|_____|_____:_____:_____ rational
14. axiomatic _____:_____:_____|_____|_____:_____:_____ absurd
15. interesting _____:_____:_____|_____|_____:_____:_____ boring
16. sophisticated _____:_____:_____|_____|_____:_____:_____ naive
17. precise _____:_____:_____|_____|_____:_____:_____ vague
18. prohibitive _____:_____:_____|_____|_____:_____:_____ permissive
19. emotional _____:_____:_____|_____|_____:_____:_____ rational
20. improbable _____:_____:_____|_____|_____:_____:_____ probable
21. insensitive _____:_____:_____|_____|_____:_____:_____ sensitive
22. apparent _____:_____:_____|_____|_____:_____:_____ unapparent
23. meaningless _____:_____:_____|_____|_____:_____:_____ meaningful
24. serious _____:_____:_____|_____|_____:_____:_____ humorous
25. motivated _____:_____:_____|_____|_____:_____:_____ aimless
26. inconsistent _____:_____:_____|_____|_____:_____:_____ consistent
27. controlled _____:_____:_____|_____|_____:_____:_____ accidental
28. weak _____:_____:_____|_____|_____:_____:_____ strong
29. static _____:_____:_____|_____|_____:_____:_____ dynamic
30. organized _____:_____:_____|_____|_____:_____:_____ unorganized

DO NOT WRITE YOUR NAME IN THIS BOOKLET.

RECORD THE FOLLOWING NUMBER IN YOUR NOTEBOOK

____

So that a brief study may be made of the answers of different classifications, please check the answers which apply to you. (Your answers will remain anonymous).

(4) Sex is: - male ____ 1 (4)
female ____ 2

(5) Classification - - - - - - - - - - - - - - - - - - - freshman ____ 1 (5)
sophomore ____ 2
junior ____ 3
senior ____ 4
unclassified 5 ____ 5
special ____ 6
graduate ____ 7

(6-7) My age at my last birthday was - - - - - - - - - - - - - ____ (6-7)

(8) My age category as listed above: - - - - - 25 and below ____ 1 (8)
26-35 ____ 2
36 and above ____ 3

(9) I (have, have not) definitely decided to
become a teacher - - - - - - - - - - - - - - - - - have ____ 1 (9)
have not ____ 2

(10) My present plans are to teach at the
following grade level: - - - - - - - - - - - - - - K-3 ____ 1 (10)
4-6 ____ 2
7-9 ____ 3
10-12 ____ 4
none ____ 5
unknown ____ 6

(11) I have taken (or am taking) the following number
of quarter hours in other Education courses - - - none ____ 1 (11)
1-3 ____ 2
4-9 ____ 3
10 or more ____ 4

(12) I have taken (or am taking) the following number
of quarter hours in Psychology and Sociology: - - none ____ 1 (12)
1-3 ____ 2
4-9 ____ 3
10 or more ____ 4

(Go to Next Page, Please)

(13) I have taken (or am taking) the following number of quarter hours in Philosophy: - - - - - - - - - - - - - none ____ 1 (13)
1-3 ____ 2
4-9 ____ 3
10 or more ____ 4

(14) I have taken (or am taking) the following number of quarter hours in History, Political Science, and Economics: - none ____ 1 (14)
1-3 ____ 2
4-9 ____ 3
10 or more ____ 4

(15) Total number of quarter hours listed in number (12), (13), and (14) above: - - - - - - - - - - - - 12 or less ____ 1 (15)
13-24 ____ 2
25-36 ____ 3
37 or more ____ 4

(16) I have taken (or am taking) the following number of quarter hours in Statistics or Tests and Measurements: - - - - - - - - - - - - - - - - - none ____ 1 (16)
1-3 ____ 2
4-9 ____ 3
10 or more ____ 4

(17) Five years from now I plan to be doing the following: - - - - - - - - - - - - teaching--public schools ____ 1 (17)
teaching--junior colleges ____ 2
teaching--university ____ 3
counselor--public school ____ 4
assistant principal or principal ____ 5
psychologist or social worker ____ 6
worker in business activities ____ 7
housewife ____ 8
other ____ 9

If _other_, specify ______________________________

APPENDIX B

RELIABILITY OF THE INSTRUMENT

Two procedures were used for checking the reliability of the semantic differential used as an instrument in the study. A distribution of deviations of group mean factor scores (of randomly selected groups) from the true mean factor score as suggested by Osgood *et al.* (1957) was used as a measure of the extent to which factor scores varied by chance. The formula developed by Horst (1949) was used for providing a unique estimate of a set of mean scores for a given entity (in this case, concept) where a number of measures were used to obtain the mean score.

Osgood Procedure

The control and experimental groups at time one were combined, making a total n of 313. The 313 Ss were randomly divided into 12 groups of 26 each; one S was not used. The n was therefore reduced to 312. Factor I of the first human concept was considered first. Using the following notation,

M_i = mean score of the *i*th group, concept 1, Factor I;

$M = \Sigma M_i/12$ = grand mean for concept 1, Factor I;

$\Delta_i = M - M_i$ = deviation away from grand mean for *i*th group;

Δ_i was computed for all 12 groups.

Using a similar procedure for the other human concepts, Δ_i was computed for all 12 groups and for all eight concepts in Factor I. These deviations were then grouped in intervals of .10, and the percentage in each interval and the probability of obtaining a given deviation were computed. The probability was computed by cumulating the percentages and subtracting from unity.

A similar procedure was followed for Factor II and Factor III. Table B.1 shows the percentage of deviations within each deviation interval and the probability of obtaining a given deviation (if groups and concepts are chosen at random) on factor scores on all three factors for the human concepts. Table B.2 shows similar information for the four factors of the abstract concepts.

The data in Table B.1 indicate that there was very little difference between factors in terms of reliability. In 96 cases (12 groups x 8 concepts) an average deviation of greater than .30 scale units in the EVALUATIVE dimension, greater than .40 scale units in the RESPONSIVENESS dimension, and greater than .40 scale units in the POTENCY dimension would be expected to occur less than five per cent of the time by chance.

Table 8.1

Probability of Obtaining Given Deviation from Test to Retest on Factor Scores of Eight Human Concepts for Groups of Subjects

	Factor I: EVALUATIVE		Factor II: RESPONSIVENESS		Factor III: POTENCY	
Average Deviation	Per Cent	p	Per Cent	p	Per Cent	p
.00-.09	.52	1.00	.44	1.00	.42	1.00
.10-.19	.29	.48	.41	.56	.39	.58
.20-.29	.15	.19	.09	.16	.13	.20
.30-.39	.02	.04	.05	.06	.06	.07
.40-.49	.01	.02	.01	.01	.00	.01
≥ .50	.01	.01	.00	.00	.01	.01

The data in Table B.2 indicate more differences among reliability of factors than with the human concepts. With the abstract concepts, an average deviation of greater than .30 scale units in the EVALUATIVE dimension, greater than .40 scale units in the POTENCY and ACTIVITY dimensions, and greater than .50 scale units in the COGNITIVE dimension would be expected to occur less than five per cent of the time by chance.

It may be that the small number of scales used in the COGNITIVE dimension caused the difference in reliability noted here, but even this factor appears to be quite stable.

Horst Procedure

The experimental and control groups at time one were combined, making a total n of 313. The human concepts were considered first. Using the formula

$$r = 1 - \frac{\dfrac{\sum \left[\sigma_i^2 / (n_i - 1) \right]}{N}}{\sigma_M^2}$$

where N = the number of concepts = 8,

n_i = number of measures of *i*th concept = 313,

σ_i^2 = variance of the factor scores for the *i*th concept,

M_i = mean factor score for the *i*th

σ_M^2 = variance of the means for the eight concepts,

r was computed for each of the factors. The mean factor scores for each human concept, the variance of these mean factor scores, the variance of the distribution of means, and the reliability are shown for each factor in Table B.3. Table B.4 shows the same information for the abstract concepts.

The range of the reliability coefficients is from .94 to .99.

Discussion

The estimates of reliability obtained by the method suggested by Osgood and by the Horst formula indicated that the instrument developed for this study was adequate for measuring differences among factor scores of groups. With random groups of 26, shifts of any factor score of greater

Table 8.2

Probability of Obtaining Given Deviation from Test to Retest on Factor Scores of Twelve Abstract Concepts for Groups of Subjects

Average Deviation	Factor I: EVALUATIVE		Factor II: POTENCY		Factor III: ACTIVITY		Factor IV: COGNITIVE	
	Per Cent	p	Per Cent	p	Per Cent	p	Per Cent	p
.00-.09	.62	1.00	.41	1.00	.50	1.00	.28	1.00
.10-.19	.28	.38	.28	.59	.26	.50	.31	.72
.20-.29	.10	.10	.19	.31	.15	.24	.19	.41
.30-.39	.01	.01	.08	.12	.06	.09	.13	.22
.40-.49	.00	.00	.03	.04	.02	.03	.05	.09
≥.50	.00	.00	.01	.01	.01	.01	.04	.04

Table B.3

Data Regarding the Reliability of the Factor Scores

of the Eight Human Concepts

	Factor I: EVALUATIVE		Factor II: RESPONSIVENESS		Factor III: POTENCY	
Concepts	M	σ	M	σ	M	σ
1. Pupils	2.37	.81	3.03	.84	3.61	.84
2. Parents	2.54	.97	2.52	.85	3.23	.93
3. Teacher	2.22	.87	2.39	.73	2.72	.80
4. Administrators	3.00	1.10	2.78	.85	2.87	.96
5. Human Beings	2.47	.86	3.34	.87	3.43	.90
6. Education Instructors	2.71	1.03	2.67	.75	3.01	.93
7. Myself	2.18	.70	2.37	.82	3.03	.91
8. Society	3.00	.96	3.58	.96	3.13	.96
	$\sigma_M = .30$ $r_I = .97$		$\sigma_M = .41$ $r_{II} = .99$		$\sigma_M = .26$ $r_{III} = .96$	

Note: M = Mean factor score of a given concept.

σ = Standard deviation of a given concept.

σ_M = Standard deviation of the means for the eight concepts.

r = Reliability coefficient for a given factor as computed by the Horst (1949) formula.

Table B.4

Data Regarding the Reliability of the

Factor Scores of the Twelve Abstract Concepts

	Factor I: EVALUATIVE		Factor II: POTENCY		Factor III: ACTIVITY		Factor IV: COGNITIVE	
Concepts	M	σ	M	σ	M	σ	M	σ
1. Teaching	1.59	.53	2.68	1.02	2.41	.81	3.30	1.22
2. American Public Schools	2.22	.84	3.36	1.08	3.42	1.02	3.17	1.13
3. Cadet Teaching	1.67	.67	2.88	1.02	2.83	.93	3.46	1.32
4. Education	1.62	.59	2.82	1.07	2.88	1.05	3.10	1.28
5. Historical Information	2.32	.91	2.80	1.11	3.99	.99	2.99	1.26
6. Learning	1.58	.51	2.85	1.01	3.06	.96	3.26	1.35
7. Philosophical Beliefs	2.06	.82	3.06	1.14	2.93	.91	3.96	1.60
8. Classroom Observations	2.17	.85	3.14	.95	3.59	.88	3.49	1.17
9. Ethics	2.17	.79	3.29	1.30	3.59	.95	3.92	1.53
10. Education Courses	2.60	1.20	3.12	1.10	3.69	1.05	3.06	1.07
11. Class Decisions	2.50	.91	3.27	1.09	3.30	.92	3.60	1.30
12. Psychology	1.84	.71	3.47	1.20	2.87	.87	3.46	1.50
	σ_M = .35		σ_M = .33		σ_M = .44		σ_M = .30	
	r_I = .98		r_{II} = .96		r_{III} = .98		r_{IV} = .94	

Note: M = Mean factor score of a given concept.
σ = Standard deviation of a given concept.
σ_M = Standard deviation of the means for the 12 concepts.
r = Reliability coefficient for a given factor as computed by the Horst (1949) formula.

than .40 scale units would be expected to occur less than five per cent of the time by chance (except for one factor, where a shift of greater than .50 scale units would be expected to occur less than five per cent of the time by chance). This expression of the accuracy or consistency of a set of measurements corresponds more closely to the standard error of measurement than to the reliability coefficient (although the reliability coefficient is not unrelated to the standard error, as indicated by the following formula:

$$r = \sqrt{1 - S\,E/S\,D}$$

where r is the reliability coefficient, S E is the standard error of measurement, and S D is the standard deviation of the distribution of obtained scores); it may prove less useful to some people than the more familiar reliability coefficient.

Where the generalized Hoyt formula was used (with an n of 313), the reliability coefficients of the measurements of factor scores for a set of concepts ranged from .94 to .99. One could hardly anticipate higher expressions of reliability on an instrument that was essentially a rating device.

Since the reliability of the concept meaning in the semantic space and the distance D that determined the difference in meanings of two concepts were dependent upon the reliability of the factor scores, it was concluded that the instrument was reliable enough to differentiate meanings of educational concepts among groups of college students.

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